The
# Electrical Review

VOL. CXI. AUGUST 26, 1932. No. 2857.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEEKAY, CENT, LONDON." Code, A B C. Telephone No.: Central 5871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to E.R. (1930) LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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## The Building Centre

WE have drawn attention on numerous occasions recently to indications that the divers sections of our industry are seeking to secure closer working the one with the other—the C.E.B. with supply engineers, supply engineers with contractors and with their consumers, and manufacturers with all groups.

But the trend towards co-operation within the electrical industry, welcome as it is, is not enough. Electricity has become so much the weft of our national industrial life in all its branches that its correct and efficient application can be brought about only by the constant association of the electrical trade with others. Of these the building trade is probably the most important to us, since the lay-out of an installation should be incorporated in the original plans for any structure.

In our leading article of July 22 we referred to the activities of the Electrical Equipment Panel of the Advisory Council of the Building Industry, and advocated the drawing up—in conjunction with that industry—of a simple set of enforceable wiring rules.

To accomplish this would be a great step forward, but it by no means exhausts the possibilities of interworking between the two interests. Another line of development is exemplified by the part played by E.D.A. in the equipment of the Building Centre at 158, New Bond Street, London, W., to which references have appeared previously in our columns, and which is expected to be opened on September 5th, rather more than a week before the Building Trades Exhibition starts at Olympia.

Even in the incomplete condition in which the Centre was during our visit a few days ago, it was evident that the stage had been well prepared for a most effective demonstration to expert and layman alike. Right from the moment of entering and culminating in the electrical section proper the influence of electricity is subtly emphasised; thus, we noticed that the opportunity had been taken to install plug-points (which will surely be used) even in the sections devoted purely to building accessories.

It is intended to show electrical materials and apparatus as far as possible in use under everyday conditions. Where this is not practicable, the more "static" exhibits will be changed at intervals to present, as it were, a "moving picture" of the goods which the electrical industry has to offer. Exhibitions of special electrical features will take place during twenty-eight days of each year in a room set aside for such purposes. The fitting up of the model electric kitchens, bathrooms, etc., has been done with imagination, and glazed flooring, where necessary, will enable the disconnecting boxes and other ordinarily hidden apparatus to be seen.

As the latest example of co-operation within our own industry (as represented by the E.D.A., the E.L.M.A., the B.E.A.M.A., the C.M.A., and many manufacturers of fittings), and also with an outside industry with convergent interests, the Building Centre deserves the fullest support of electrical engineers This support should be forthcoming not on sentimental grounds, but because the Centre will provide a materially useful display of the latest electrical products.

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**Ottawa and After**

SPOKESMEN on behalf of British industry are courageously expressing themselves regarding the effects of the conclusions reached by the Imperial Economic Conference at Ottawa. However confident one may be about what will be the ultimate advantages of the adoption of a common policy consolidating the commerce and industry of the British Empire, only the most optimistically inclined will attempt to predict any immediate substantial effect upon our electrical and engineering industries. No doubt the first, and perhaps for some time the only, substantially perceptible influence will be the general contribution that the agreement will make to the return of confidence and the removal of some of that uncertainty that has been in the minds of our manufacturers regarding future chances in our overseas possessions.

The British Empire has such vast undeveloped territories and resources that its dependence upon engineering and electrical enterprise and production will be very great indeed as the years pass, and if our Home industries can contribute their fair share thereof without too adversely affecting their interests in other important markets, all will be well. Some of our leading industrialists frankly express the view that good results cannot be immediately apparent, but may be expected to spread themselves over the next few years. The agreements, if they afford facilities for a fair run or reasonable competition with Dominion manufacturers, and a preference which lessens the keenness of foreign penetration, in some places, can be considered a move toward stability, and anything of that nature should impart a direct impetus to trade. But not yet can we see even in the dimmest outline what will be the effects from the purely electrical point of view. Some of the decisions bearing in that direction are abstracted in our "Business and Industrial Notes" to-day, but much may depend on later conferences.

**Broadcasting Progress**

THIS week marks the end of a decade of British broadcasting. Ten years of organised service reflect great enterprise and perseverance. The rate of increase of licensed listeners shows no sign of diminution; nearly five million homes are equipped with receivers, which means that at least half the population of the British Isles derives regular entertainment from the service. Gone are the days when radio was regarded as the preserve of the expert; to-day it is a necessary part of normal domestic life, but a change in outlook has come about, inevitably. The technicalities of constructive detail are no longer of chief interest, and season by season intelligent criticism of reproduction becomes more keen and well informed. The technically minded will find interest in Mr. P. K. Turner's critical review of the National Radio Exhibition elsewhere in this issue; what the majority wants to-day is efficient reproduction, and the Olympia show demonstrates how far the manufacturer is meeting the demand for reasonable fidelity combined with simplicity of operation.

**A Television Advance**

ANOTHER major event of the week has been the inauguration of a regular television service sponsored by the British Broadcasting Corporation. For half an hour on four nights per week the London national transmitter will radiate vision on a wavelength of 261.6 metres, and the midland regional transmitter will radiate associated sound on a wavelength of 398.9 metres. These two stations have been chosen because they are normally inactive between 11 and 11.30 p.m.; ordinary listeners will accordingly suffer no curtailment of entertainment. All programmes will originate from the London headquarters, where a check receiver has been installed, and definition is being bettered by improving artists' make-up technique. Mr. John L. Baird is to be congratulated on the development of his method to the practical stage, thus providing a manufacturing incentive. Hitherto, because of the absence of any security of tenure of transmission, so to speak, the commercial production of reception equipment in any quantity has hardly been worth while.

**Prospects in the North-East**

The report issued by the Board of Trade on the industrial position of the North-East Coast is not a cheering document. The conclusion is drawn that even in electrical engineering the next two years will see some decline in orders as work for the grid comes to an end, unless the railways are electrified. This view has surely a general rather than a local bearing, as the electrical manufacturers on Tyneside do not cater for the North-East Coast only but for the world. As in other areas, they have foreseen the possibility of a falling-off in the demand for some products and are busy developing new lines for which the future holds distinct prospects. Mr. Clothier recently stated in an interview that he was certainly not pessimistic about the future of electrical production in the area—nor are we.

**Post Office Reform**

THE Committee, consisting of Lord Bridgeman (chairman), Lord Plender, and Sir John Cadman, which was appointed by the Postmaster-General last February to inquire whether any changes in the constitution, status, or system of organisation of the Post Office would be in the public interest, has presented its report (H.M. Stationery Office, Cmd. 4,149, price 9d. net). The Committee is unanimous in all its opinions and recommendations. It considers that Parliamentary control is essential and that any defects in the existing organisation can be remedied without change of status. A board is proposed, representative of the various functions, with the P.M.G. as chairman and a director-general as his deputy, to frame a policy for the whole country; while part of the profit, not the whole as at present, should go to the Treasury, the surplus to be devoted to the improvement of the service. The main mass of criticism was apparently directed towards the telephone system. The evidence before it leaves the Committee little doubt that the telegraph service, as such, is on the decline, and it accordingly recommends that it should in due course be merged with the telephone service. Staff reorganisation and decentralisation are also suggested.

**An Exceptional Case**

ONE of the first things to strike us when looking through the ninth annual report of the Electricity Supply Commission of South Africa was the relatively low thermal efficiency of its largest power station, that at Witbank. This 100,000-kW station was responsible for the production of 603 million out of the 867 million kWh sold by the Commission in 1931; the station load factor exceeded 75 per cent., and the 91.5 ratio of the maximum demand to installed capacity indicated a high plant load factor also. Yet the thermal efficiency was only about 16 per cent., with a fuel consumption of 1.73 lb. per kWh generated. Closer investigation indicates that sound engineering economics has been the deciding factor. Witbank is supplied with duff coal with the good average calorific value of 11,400 B.th.u. per lb., at a price of 2s. 2d. per ton of 2,000 lb., costing one penny for every 41 kWh sold. The capital cost per kW installed (£18.7) is appreciably lower than that of the other stations where coal costs are unsensational and the overall cost of generation per kWh sold is 0.126d., one of the lowest in the world. Clearly Witbank presents one of those exceptional cases in which the spending of capital to achieve the highest technical results would not have been justified.

**Scope for Development**

IN our "Power in Industry" special number of June 17th, Mr. V. W. Dale showed the immense field for development by supply authorities in catering for the load supplied by works plants. The current number of the *Board of Trade Journal* states that in the coke and by-products and manufactured fuel trades not less than 97.4 million kWh was generated at the works as against 40.7 million kWh purchased, the total h.p. of motors being 75,871 and 18,699 respectively. The influence of waste heat from the coke ovens is evident, but the tendency has been for the surplus heat available for the production of electricity to diminish very considerably with process improvements. Thus the old "beehive" ovens were very useful for generating electricity compared with present types, but this function is very rightly subordinated to the main business. The point is that new coal-fired boilers should not be installed at the works, on account of the diminution in waste heat, without investigation of the possibilities of interconnection with the public supply to obtain additional energy for the main plant and auxiliaries and stand-by supplies in the event of breakdown or of disputes in the coal-fields.

# This Year's Radio Show. By P. K. Turner

## A critical review

Mr. P. K. Turner, M.I.E.E., is a well-known radio designer

THE Radio Exhibition has certainly started well this year. Our colleagues of the daily papers have at last realised that radio is "News," and the show has had a wonderful Press. And in spite of the fact that both Friday and Saturday last were just under the record for heat, the attendance was very large. It is thus really an ungrateful task to set out and examine the exhibits in a carping spirit; but after all, a "critical review" must not confine its attention to the good points only.

### Receiving Sets

Comparing this year's show with those that have preceded it, the thing that made the strongest impression on me was the persistence of the exhibitors' idea that the buying public do not want good musical quality, will not pay for it, and cannot recognise it when they hear it. Sets this year are really extraordinarily cheap, for the work that is in them; and the more expensive ones intended for distant reception have extreme selectivity and sensitivity. Appearance and ease of control have also been studied; but there is in general still no improvement in the audio-frequency side of sets. A frequency range of 120 to 5,000 cycles and an output power of one watt seems still to be the standard of even the better-class sets. One can, of course, understand the adoption of this very low standard where the manufacturer of a radio set is also interested in the sale of gramophone records; but it is very puzzling that specialists in radio only should be content with it, especially as an extension of the frequency range costs little and produces such a marked improvement in quality.

Among the higher-class sets, of long range, the supersonic type has increased rapidly in number, a long-expected trend of design now possible in practice owing to improvement in the accuracy with which coils can be made. For as long as the coils were of uncertain accuracy, the "log-law" condenser was the only type with which ganging of controls could be done reasonably accurately; and to tune a supersonic set accurately with one knob called for a special condenser of different law, and therefore offered great difficulties till coils could be produced in quantities with an accuracy of 0.5 per cent. or so.

The very interesting type of set in which selectivity is obtained by one tuned circuit of extreme sharpness, with an l.f. stage compensating for the resulting loss of side-bands, is still slow in reaching the production stage, although there are one or two on show. My own experience in the design of these sets has shown me that there are considerable difficulties in making them suitable for factory production and use by the unskilled, though their performance is startlingly good when they are properly handled.

For sets of shorter range, the three-valve combination of a screened grid valve, a detector of the grid rectifier type, and a pentode, still seems the most popular, though there are still a few manufacturers who have seen through the apparent advantages of the pentode to its real disadvantages for this type of set, and have installed a triode as power valve. There is now not so much fuss about "power grid" rectification; it has been realised that linear rectification can be obtained with quite small detector current, if the circuit is properly designed.

There are one or two excellent examples of really cheap local-station sets. The Brownie two-valve battery set is actually offered at £3, complete with loud-speaker, and the mains model at £9 9s. In the production design of receivers there is a slow advance, though still the vast majority have components held down individually by several screws and connected by soldered wiring. One of the G.E.C. kits is a notable exception, making full use of stamped strip connectors, secured by eyelets.

### Components

One notable thing about the show is the increase of the number of components made by specialists for the use of manufacturers as well as for the home constructor. In many cases these represent a real advance—in convenience—even where the performance is unaltered. This applies particularly to fixed condensers, both of the electrolytic kind and of the usual type; and also to resistors. Variable condensers continue to improve in durability and accuracy, though I note a minor fault in one or two of the best: an undue stiffness which puts quite a strain on the slow-motion device which operates them. There is now an almost embarrassing choice of both single and ganged types.

But in the other half of the tuned circuit—the coil—there is still room for much improvement. There are many sets of coils, of excellent appearance and probably with quite good accuracy; but they are almost all too much alike in design. For example, most of the "band-pass" outfits are designed for a very narrow wave-band. It is usually a nominal 5 kc each way; but I know of several cases where it is actually less, only about 3 kc being reproduced at full strength. In my opinion, any coil manufacturer worthy of the name should offer band-pass sets of two or three different band widths. Also, though the present favourite method of construction, with screened coils and metallised valves, is undoubtedly fairly successful in practice, I have found that one or two sets of exceptional stability and performance use unscreened coils and

A night view of the Radio Exhibition at Olympia

plain valves, shielding each stage complete in a screening box. The "Osram Music Magnet" is an example.

One thoroughly sound idea is to be seen on the stand of British Radiophone (a similar device is shown by Formo): a complete assembly of variable condenser and coils, ready connected up and calibrated; and this at a price very little greater than that of the separate components. Since the exact layout of the h.f. wiring between coils and condensers has such an important bearing on the stability and performance of a set, an assembly like this, well carried out, is most valuable. It is to be hoped that the idea will be carried further to cover different circuits.

Turning now to the l.f. components, it is at once obvious that there is no just cause here for the poor musical quality of manufactured sets, referred to above. For there is an excellent variety of intervalve coupling devices giving an ample frequency range. Transformers of high-permeability material, specially designed for use in circuits where the d.c. component is kept out, are increasing in number, and an interesting novelty is the provision of the feed resistance, coupling condenser, and transformer, all in one unit. Another is the introduction of "tone-correcting" transformers in which great changes in the response curve are produced by a variable resistance. These are quite interesting, though my own feeling is that they should be used with reserve till we know more about them.

The design of audio-frequency chokes seems not to progress. It is fairly easy, by the use of a deep enough air gap, to make a choke of any inductance for any d.c. component, even on a small core. The criterion of quality is to get the lowest possible d.c. resistance while meeting the other conditions, and I see room for considerable improvement in this respect. By good design chokes could be made of lower resistance at their present cost or, alternatively, could be cheapened while keeping their present resistance.

## Valves

As the basis of the whole broadcast radio industry, the development of the valve is a matter of supreme interest. This year there is nothing very startling. It has been realised that many valves of very high conductivity and high M value do not in practice give the expected results when used as detectors owing to their high Miller effect—a point which I myself pointed out to one maker.

The 25-watt output valve of high conductivity, introduced by Mullard's last year as the "DO24," has become a standard type offered by several makers, and is valuable, though (like nearly all oxide-filament valves of high performance) it is not so good in some ways as the corresponding thoriated-filament valve. It seems almost impossible to prevent "tailing"—the persistence of current at high anode voltage even when a high grid bias should theoretically reduce it to zero—and this causes appreciable second harmonic distortion to arise before full load is reached.

A variable-M screened valve for d.c. mains was an urgent need that has been met this year, but there is still no good high-power valve of this class, the largest d.c. mains valve being a pentode of 8 watts dissipation. If there is to be any hope of good reproduction on d.c. mains, we must have a triode taking say 20 or 30 volts at 0.25 amp. on the heater and dissipating at least 13 watts, so that two of them will give the required 25 watts dissipation.

I am still astonished at the popularity of the pentode in conditions that really do not suit it. Of course, where the prime necessity is the greatest possible economy of h.t. voltage, and purity is not important, the small pentode has great possibilities, though it is not always realised that the high watt efficiencies claimed for it are often only to be obtained at the cost of large third harmonic distortion. It is obvious to the electrical engineer, though apparently not yet to the radio expert, that as the addition of a fairly large third harmonic of appropriate phase decreases the amplitude by giving a flat-topped wave, so the output of a pentode giving a symmetrical flat-topped wave can be analysed into (*a*) a strong third harmonic, and (*b*) a fundamental of greater amplitude than that of the complete wave; and as efficiences are calculated on the fundamental amplitude, surprisingly high figures can be shown.

The present writer discovered, during the past year, a new type of valve curve-sheet for detector valves, which gives the designer the same facilities as he gets from the standard anode-volts/anode-current curve-sheet of an amplifying valve. Unfortunately, however, the valve makers have not yet published such curves, and (judging by the amount of pressure required to get them to publish the present $I_a$—$E_a$ curves) it will probably be years before they do so.

The standardisation of power rectifying valves has been useful, and the severe competition between valve and metal rectifiers for a.c. mains sets (which does not exist as regards ordinary valves) has undoubtedly been a factor in making both types of rectifier extremely cheap for the power obtained. Apropos metal rectifiers, the physicist should not fail to visit the Westinghouse stand to discuss the interesting fact that the metal rectifier is a very effective photo-electric cell having, I believe, the unique property of actually *generating* an e.m.f. when illuminated, and not merely changing its resistance to an applied voltage like other types.

## Loud-speakers

Last in the chain of apparatus between the studio performance and the listener's ear comes that much-discussed instrument, the loud-speaker. Here matters are rather delicate for me; for I am at the same time exhibitor and critic. Last year, I stated that there had been no advance in the design of moving-coil speakers (except in price reduction) since their first introduction. As regards the usual type of instrument, this is still true. But there are at last signs that the makers are beginning to realise that all is not quite as it should be. In several cases improvement of overall performance is got by combining two speakers, with the general idea that the "peaks" in the response curves of each will mask the "valleys" in the curve of the other. But such outfits must be purchased with care. In one case the maker has privately made the cynical admission that "of course I am showing a dual speaker. If my customers are willing to buy two speakers every time instead of one, I am all for it."

Of my own speaker, it is only fitting for me to say that at any rate every point in its design is the result of much thought and research; and that if my claims for it prove justified it is a real advance in loud-speaker technique. It is hoped also to exhibit a duplex speaker outfit for high-power work, capable of handling 25 watts of audio-frequency power, and with a frequency range of at least 40 to 11,000 cycles.

## Cabinets

The last "component" to be reviewed is cabinet-work, which is becoming more and more important. This is so not only because the broadcast receiver is becoming more and more part of the home instead of a faddist's hobby, but also because the increase in the power of receivers (though still insufficient) and the tendency towards self-contained outfits call for certain technical precautions in the cabinets.

In a great many cases the desire to offer a self-contained instrument at a moderate price has led to a totally insufficient baffling effect—one finds moving-coil speakers in sets only about 15 in. square. It must be realised that the bass loss of a small baffle is more than many people suspect: flat baffles show a steady and obvious increase in bass performance right up to 6 ft.—above that the improvement is not so obvious—and practical cabinets cannot be too large from this point of view. Again, the cabinet made deep from back to front to accommodate a gramophone turntable needs special precaution to avoid resonance of the contained air.

These matters are for the set designer: but there is another that concerns the cabinet-maker. Light panels are ineffective baffles, and also often drum in an annoying fashion. There is no doubt that for the best results the panels of a cabinet should have a thickness of at least ½ in. for every foot of their least dimension.

## Publicity Methods

And now, leaving the detailed consideration of the various goods offered, what of the methods of the exhibitors? There is still a great variation of taste in stand arrangement and decoration, from the very worst slum shop window type to some very fine examples of display; and there is the same wide range of knowledge in the attendants, from the condescending ignoramus in a super gents' suiting to the (alas! rather rare) radio engineer with real knowledge; or on the other hand the skilled and courteous salesman capable of selling a technical product to an ignorant public.

The larger and more responsible firms seem now to have given up the ridiculous practice of having bevies of alleged beauties in fancy costumes idling about their stands; but unfortunately these fairies seem to have been taken over by other exhibitors. The organisers exercise considerable control over the fixed decorations of the stands; they might well also keep a watchful eye on this sort of thing. It may serve for some exhibitions, but is quite out of place at the radio show.

Another feature of this year's show, which seems undesirable to me, is the tendency for large demonstration rooms to be used for various publicity stunts, such as vaudeville performances, cinema shows, etc., instead of for simple demonstrations of apparatus exhibited on the main stands. This is, of course, an indirect consequence of the method adopted for demonstrations on the stands themselves. It is essential for any effort to impress the musically minded to have either a demonstration room or else to take premises outside the show. Perhaps some better arrangement can be found next year.

To sum up: a good show, and more progress this year than last, but still not enough from a music-lover's point of view.

**Some views of this week's Radio Show at Olympia**

1. The attractive illuminated pylon; 2. The exterior of the Exhibition buildings; 3 & 4. Two comprehensive photographs taken from the gallery. 5. Showing the gallery and ceiling lighting; 6. The G.E.C. demonstration room

# High Voltage Insulators. By W. Howard Miller

## Experience in Victoria as to their design for sub-stations

THE design and assembly of multi-part insulators, with or without metal caps or pins, calls for the greatest of care and a regard for certain essential principles.

We have, in porcelain, a relatively inelastic medium having a low tensile strength and a high strength in compression combined with an extremely low temperature coefficient. This material has to be joined, part to part and part to sections of metal having widely differing characteristics, and the only satisfactory media for the assembly of the material have in themselves characteristics differing again from either porcelain or metal.

With this basis it becomes obvious that, for the successful design of multi-part insulator units, attention must be concentrated primarily on the elimination of stresses in the unassembled components. Foundry practice can serve as a most useful guide in this respect; what is bad in the design of a metal casting is worse than bad in the design of porcelain.

Where the electrical stresses are uniform the basic section must be uniform, and where change of section is necessary or permissible, as in the areas where the air is the medium under stress at the exposed flanges and petticoats, such changes must be gradual and sweeping.

For the purpose of maintaining a high gross surface resistance, secondary petticoats are formed beneath the main sheds of many insulators, and the effect of abruptly changing sections at the root of such petticoats may be most marked. The maximum surface is obtained by making secondary petticoats narrow and deep, and this same condition serves best for the elimination of forming and firing stresses. In insulators of relatively large diameter and horizontal surfaces a marked tendency toward radial cracking must exist. This may well be relieved by forming a bulbous section at the outer rim, which, at the same time, relieves electric stress at this point.

### Assembly of Parts

Accepting the basis of design of the separate shells, we next consider the question of assembly. Cement has characteristic expansion effects, both thermal and those due to crystalline growth. These features have to be considered very seriously if a reasonable life is to be expected from the finished product. Thanks to the extraordinary strength of *well-made*, neat Portland cement joints combined with the complete and satisfactory distribution of mechanical stresses by means of the bitumen-coated sanded porcelain surface, the length and area of the cemented surfaces may be limited to dimensions well below the limits where excessive stresses due to expansion may occur.

In this connection it must be noted that there must be *no* cement at any point where joint strength is not demanded; this, is, of course, a counsel of perfection, but it is, nevertheless, a simple matter to so shape the nesting portions that when assembly is made the horizontal faces and rounded corners make intimate contact. A liberal coat of paraffin wax over the surfaces in contact, but not sand coated, suffices to prevent damage from expansion of such small quantity of cement as may be entrapped there, at the same time ensuring that the mechanical stresses are taken on the sanded surface only.

A decided improvement may be effected and additional resistance to cracking be given to the assembled unit if the exposed edge of the cement joint be undercut from ¼ in. to ⅜ in., leaving the outer shell overhanging the joint.

### Tests at High Frequency

Electrical tests of the unassembled shells should be of the utmost severity. Sound porcelain has nothing to fear from a severe testing, and no other porcelain should find its way into a commercial product. No testing specification should omit tests at 200,000 cycles nor those with steep fronted impact cycles. After a long experience with porcelain testing in which I have carried out post mortem examinations of large numbers of punctured shells, I can say without fear of dispute that, in every case where porcelain with sufficient thickness for the test concerned has failed under these tests, there has been positive evidence of concealed faults.

The normal frequency test specified in British Standard Specification No. 137/1930 will make no impression on shells containing laminations or internal flaws unless the flaws are of a very serious nature. Raising the applied voltage until a condition of violent sparkover with bright bluish sparks is attained raises the standard of the test to a remarkable degree, again without risk of damage to sound material.

Recently I had the opportunity to examine and test a large batch of insulators manufactured and tested by a firm having no facilities for high-frequency testing. Each piece had passed the B.S.I. test at 50 cycles. As a matter of interest I retested the batch first at 50 cycles with violent sparkover and then at 200,000 cycles. In the 50-cycle test, approximately ten per cent. of the insulators punctured, and in the high-frequency test, the balance all punctured.

Post mortem examinations showed that small cracks had started in the roots of the threads of the pin holes in the insulators which failed under the 50-cycle test, and that the whole batch had small air holes concealed in the body as the result either of faulty working of the clay or faulty firing. Had the British Standard test been accepted as final, all this faulty material would have been passed for service.

### Merits of Pin-type Insulators

The insulator on the left of page 375 of the ELECTRICAL REVIEW of March 11th can hardly be taken as a fair basis for comparison when considering the relative merits of the pin-type insulator as against the cylindrical post type. When a design such as that shown has the poor performance one would anticipate from a very casual glance at the drawing, it would seem to me that any engineer would make a detailed investigation as to the reasons why the insulator under consideration had not the performance established in the past by competing material, not necessarily in his own country, before making such a radical departure as to sacrifice flashover and ruggedness to gain freedom from cracking.

The principal merits of the multi-part insulator for sub-station work are its freedom from the possibility of puncture combined with high flashover and high mechanical strength in torsion as well as in tension, compression, or cross-bending. When to these is added the fact, readily established, that, with intelligent design, cracking does not occur, the argument in favour of the cylindrical post disappears except as regards the point of self cleaning. I have yet to learn of a sub-station where routine inspection and cleaning of insulators is not regarded as good practice.

### Mechanical Strength

I am in complete disagreement with the contention in the article of March 11th that the insertion of elastic layers reduces the mechanical strength. My answer is: "Try it and see." A layer of suitably thinned bitumen painted on good, even, sharp porcelain sand is all that is needed to give the necessary relief against expansion where the actual relative movement is of the order of 0.001. I have demonstrated quite often that this coat will actually raise the ultimate mechanical (and electro-mechanical) strength by distributing the load from otherwise highly stressed areas.

Reference to Continental practice is irrelevant as it has never been the practice on the Continent, as far as my experience goes, to use a sanded surface for making joints. The practice in England and on the Continent of knurling the joint surface and then using cement as a jointing medium is sufficiently well known and associated with the troubles it has caused to call for no comment here.

The reference to joining parts with long courses of cement is misleading and again refers to inexperience on the part of the designer. In actual practice the strength of the unit is the strength of the porcelain, and a remarkably narrow cement course is capable of fully developing that strength. Again "Try it and see." The correct mixture of cement and water for maximum strength and the curing of the resulting mixture have a considerable bearing at this stage. It is wrong to blame the insulator for failing if your idea of cement mixing is to make a liquid grout, and leave it to cure itself. It will; also it will cure your customer.

### Some Practical Suggestions

I give a few practical suggestions as to what is wrong with the multi-part insulator shown on p. 375 as the cemented pedestal insulator. In the first case the metal pin with its special flange used to grip the lower portion of the central porcelain will present a problem to the man doing the assembly. How is he to judge when he has the cement around the pin in the correct quantity and in the correct position; and, assuming that it is possible to make a joint of any sort at the lower flange, how is he to trim the joint at the upper end to avoid expansion stresses vertically and cracking of the porcelain at the upper end of the joint? When the pin is heated, a very considerable axial tensile stress is placed on the central porcelain, this stress being accentuated by the length of the pin. This stress would cause cracking of the porcelain at the lower limit of the joint between the central and intermediate porcelains at a point weakened by the quite unnecessary change in cross-section. The remedy is to increase the diameter of the pin and make a proper key surface on the metal head with a

# Some Driving Forces in the Industry

**Directors and Officials of the Midland Electrical Manufacturing Co., Ltd.**

1. Mr. T. Birkett, general manager. 2. Mr. W. L. Barber, founder and managing director. 3. Mr. V. Gabriel, assistant general manager. 4. Mr. R. W. S. Mackay, sales manager. 5. Mr. A. Vicary, electrical engineer. 6. Mr. H. Morgan, assistant secretary. 7. Mr. A. Wynn, works superintendent. 8. Mr. B. Homer, cost accountant. *(Photographs, except No. 2, by Commercial Studios.)*

## High Voltage Insulators *(Concluded from preceding page)*

slight taper upwards. The flange should be eliminated and the profile of the shell amended to give the highest possible flashover. It should be possible to raise the flashover of this section by from 30 to 40 kV without sacrificing a foot-pound of torsional strength.

In assembly, paraffin wax in the bottom of the pin hole, a light coat of bitumen paint on both the pin and the sanded pin hole, with a wad of cardboard or cork on the top of the pin as a cushion, will relieve the stresses, and well mixed cement properly tamped down and cured will provide the mechanical strength. The slight taper aids in the relief of expansion stresses, and, at the same time, the resulting taper in the porcelain shells reduces the necessity for abrupt changes in shape where the petticoat proper leaves the joint.

### Thickness of Porcelain Shell

The intermediate porcelain shell for some reason is shown to be thinner than either of the other shells. This is not in accord with good practice where the several shells have the same thickness and the petticoats are shaped to provide correct stress distribution. The abrupt change in thickness at the lower edge of the interior joint is looking for trouble. Elimination of this step by sweeping the outline at this point and straightening the petticoat would do no harm and vastly improve the result. There can be no justification for the horizontal course of cement between the intermediate and the central shells or between the intermediate and the outer shell. At these surfaces the porcelain should be in contact with porcelain, except for a coat of paraffin wax to prevent gripping.

The outer porcelain shell enjoys the advantage of having the thinnest porcelain at the point of maximum electrical stress, and for no other apparent reason than to obtain a wedge grip between the insulator and its metal cap, again showing a want of knowledge of the gripping power of properly mixed Portland cement on a bitumen-coated sanded surface. On the interior joint surface an extension downward to increase the joint area probably serves no other purpose than to increase the tendency to crack and lower the flashover voltage of a fouled insulator.

### Fixing the Metal Cap

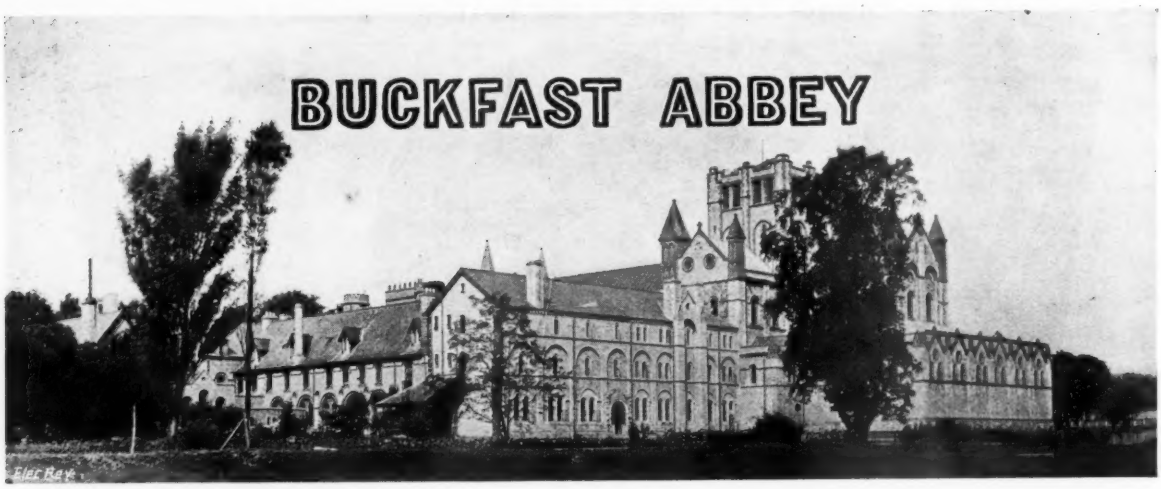
The lightness of the metal cap is out of all proportion to the sturdiness looked for in the general construction and would probably cause deformation stresses. Apropos of the metal cap, I remember not very long since a sample 66-kV bus insulator with set bolts and holes tapped right through the casting. It was a very simple job to force the cap to part company with the insulator by tightening down the set bolts. Studs and nuts cost so little more than set bolts anyhow, and a stripped thread means only the replacement of a stud; besides, the use of studs facilitates assembly; on the whole the use of set bolts is poor economy.

A point I have not seen raised about the cylindrical post is the risk of a post being shattered and dropping its load of switchgear to the ground. It is not at all difficult to conceive an arc-over, an operation impact, or impact of a flying missile completely severing a porcelain column, whereas nothing short of a devastating power arc would ever trouble the multi-part stack.

My conclusion is that, if the insulator manufacturer concentrates on intelligent logical design with the serious intention of giving maximum flashover, puncture strength, mechanical strength, and durability per unit of investment, he will produce for all sub-station and outdoor switchgear supports cleanly designed multi-part cemented insulators.

## The Canadian National Exhibition

At the Canadian National Exhibition which opens at Toronto to-day (Friday) some 15,000 exhibits arranged over an area of 350 acres will be on view. The extent to which the potentialities of the Canadian market have attracted the attention of the British manufacturer is reflected in the variety of the exhibits from the United Kingdom.




# Features of the Electrical Installation

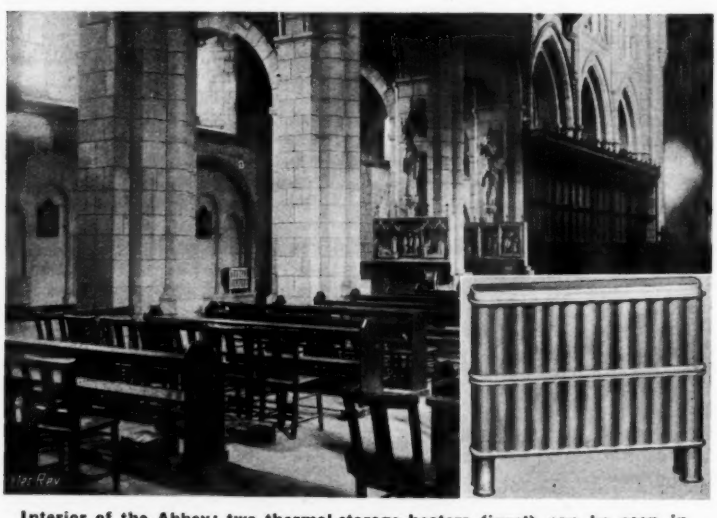
THERE is a good deal of electrical interest at Buckfast Abbey, that wonderful structure in South Devon that has been built during the past few decades practically wholly by the resident monks, and which was consecrated on August 25th. Not only has the electrical work been designed and carried out by the engineer-in-charge, one of the community, with very little outside help, including much of the civil engineering work in connection with the small hydro-electric station erected to serve the Abbey in 1918, but the church is believed to be the only one of cathedral size in the west country to be electrically heated.

The water station utilises the thirteen-feet fall (average) of a loop canal off the River Dart. There is installed a 22½-in. vertical-shaft " Gilkes " Francis turbine fixed in an open penstock. It develops 20 b.h.p. and uses 1,080 cu. ft. of water per min., the shaft running at 206 r.p.m.

## The Generating Plant

The turbine is fitted with movable guides, giving efficient operation on variable load and variable water supply. The runner and shaft are carried by an above-water suspension bearing of the combined ball thrust and roller journal type. The turbine is situated on a floor about 7 ft. above the tail-water level, and has a long suction flume which allows use of the suction head as well as the pressure head. A countershaft is driven at 430 r.p.m. through bevel gearing, the pinion having " Fabroil " teeth to reduce the noise. When load is removed from the turbine the " Gilkes " oil-pressure governor automatically adjusts the openings through the guides, thus controlling the water supply and the speed, the automatic regulation being within very close limits.

The alternator set (General Electric Co., Ltd.), is belt driven at 1,500 r.p.m. from the countershaft, and is complete with its 0.5-kW exciter, 90/105 V, and a mechanical-vibration voltage regulator supplied by Messrs. Isenthal & Co., Ltd., both of which are mounted on the same shaft.



**Interior of the Abbey; two thermal-storage heaters (inset) can be seen in the recesses along the aisle on the left.**

The engineer is very pleased with his generating plant, and stressed the fact that it has given no trouble whatever since it was first installed, and that the voltage regulator renders the plant practically automatic. This regulator maintains the alternator voltage constant under all conditions of load and temperature, although the load may vary rapidly. Immediately a change occurs the regulator responds by varying the voltage air-gap between the contacts, thus directly modifying the field strength to meet the alteration in the load conditions.

## Arrangements for Public Supply

Further, the engineer is deeply concerned because, owing to water-shortage difficulties, it has been necessary to take a public supply. This supply is received from the Torquay electricity undertaking at 2,000 V, three-phase, 50 cycles, and is governed by a 50-A oil circuit breaker with two multi-core cable connections, inlet and outlet, and an ammeter, supplied by Messrs. Erskine Heap & Co., Ltd.

The supply voltage is reduced to 400 by a 75-kVA, air-cooled, oil-circulation transformer, with 2,000- and 2,100-V tappings, supplied by the Foster Engineering Co., Ltd. Metering is effected on the l.p. side, and the outgoing phases to the station switchboard are controlled by " Kartret " fuses.

Referring to the illustration of the switchboard which appears on the opposite page, on the first black panel, from left to right, is mounted the alternator control equipment. The hand switches at the bottom serve for exciter and alternator operation, and the automatic switches at the top function mainly in a protective capacity. The second black panel is for the dual switching arrangements and metering, throw-over switches being connected to both the private- and public-supply services for heating and lighting separately. Distribution for heating and lighting is effected by the third panel.

Automatic switching for the thermal-storage heating in the abbey is effected by a 60-A Satchwell relay controlled by a Sadia time switch. There are no batteries installed in connection with the generating plant, and a " Davenset " unit is used for the purpose of charging small batteries.

The Abbey heating system is a combined one with thermal-storage basic heating mainly for which the hydro-electric station is used, demanding practically sixteen hours' continuous running per day, depending on the water available. During the first four months of this year 21,054 of the kWh used was generated by the hydro-electric plant, and the remaining 16,728 kWh was received from the public supply.

## Thermal-storage Heating

The Abbey church is 240 ft. long, 65 ft. wide, and 49 ft. high in the main, with transepts 85 ft. long and 49 ft. high. The volume of the building is 465,703 cu. ft. For the thermal-storage heating there are twelve 2-kW " Soapstone " radiators supplied by Soapstone Products Co., and they are arranged round the building in two banks of six each, five radiators being situated in the recesses down each aisle, and two at the east end of the building.

During the day in cold weather the storage-heater banks are alternately switched on and off every two hours, and during the night all the radiators are left on circuit

for varying periods, each at half load. It will be recalled that the " Soapstone " radiators are constructed from natural soapstone quarried in northern Sweden. The material has a great capacity for heat storage and also, apparently, a much greater ability for absorbing heat than for emitting it, so that heat is accumulated while it is radiated in lesser degree.

The basic heating is supplemented by twelve 10-ft. and twelve 8-ft. tubular heaters supplied by Messrs. Walker, Hunter & Co., Ltd. These are employed for local heating during services, &c., being installed under the nave benches and choir stalls, and they are served mainly by the public supply. The total loading of the tubes is 8¼ kW.

During a test period of twenty-four hours last winter, when the thermal-storage and local heating consumption were normal, *i.e.*, 240 kWh and 160 kWh, respectively, it was found that when the exterior temperature was 39 deg. F. the interior temperature had been raised to 50 deg. F. On another occasion the interior temperature was 49 deg. F., with 36 deg. F. outside.

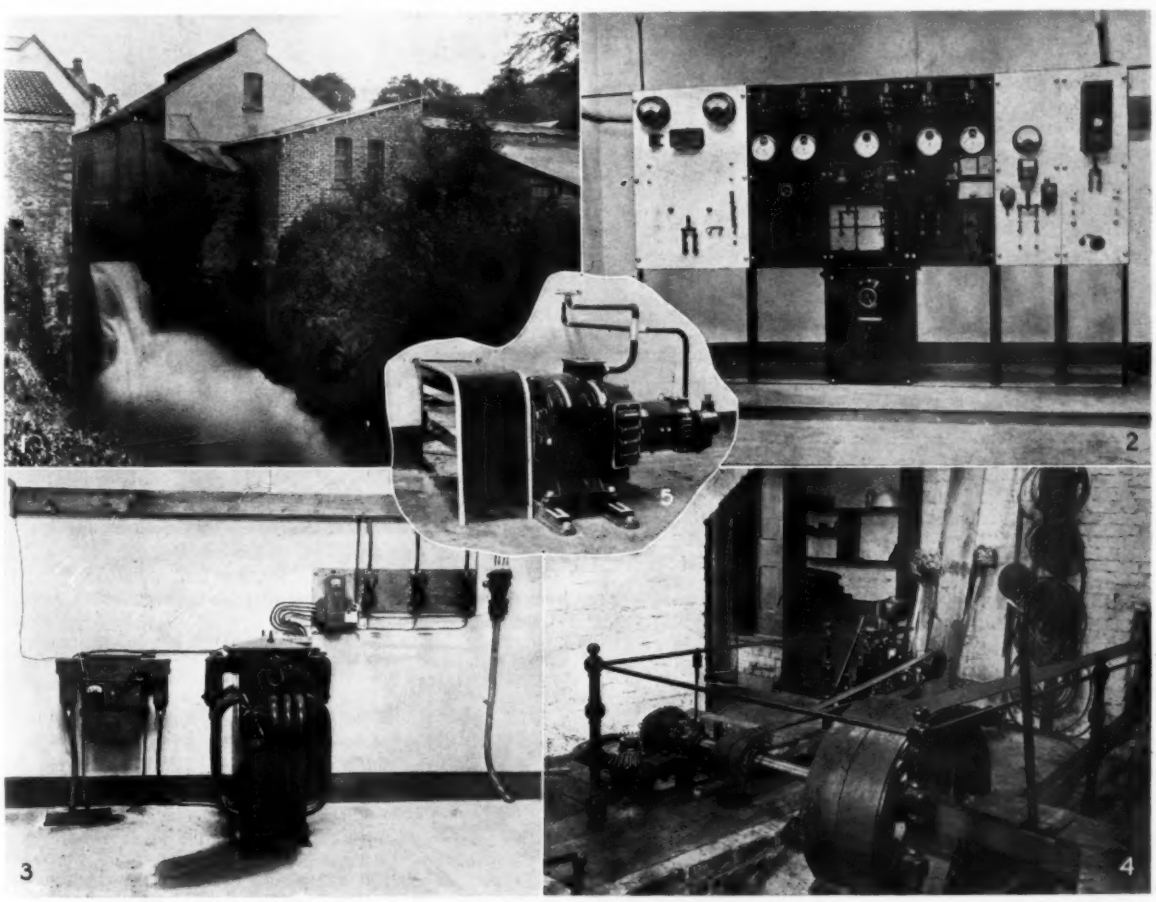
Apart from the time-switch governing in the power house, all the heating equipment is hand controlled in the Abbey, but thermostatic control is now being considered.

We did not have the opportunity to see the church artificially illuminated, but we were impressed by the neat arrangement of bracket fittings partially concealed in corners and recesses of the supporting pillars, &c. The lighting fittings were supplied by the General Electric Co., Ltd. The engineer told us, however, that the present lighting system is regarded more or less as a temporary one.

The two supplies, private and public, are received in the Abbey in a distribution cupboard about 6 ft. by 3 ft., in which Crabtree, B.I., and M.E.M. equipment, &c., are neatly arranged with the three-phase cable split on the vertical-distribution principle, the single-phase cable terminating in a main switch-fuse, and with both supplies sectionalised, serving change-over switches.

For the lighting Macintosh cable is cleated round the walls of the triforium, with Macintosh junction boxes at frequent intervals for tee-offs for special lighting and alterations to the system, &c. " Maconite " cable drawn in conduit cemented in the floors, &c., is used for heating circuits.

A Macintosh junction box and a Crabtree switch-fuse control each storage heater and bank of tubes, and flexible metallic tubing was seen running from the ends of tubes to the floor.




**Views of the Electrical Installation at Buckfast Abbey**

1. Power station, showing weir and tail-race; 2. Station and distribution switchboard; 3. Incoming public supply and transformer equipment, &c.; 4. Driving arrangements from turbine (below floor) to alternator (behind rear wall) and oil-pressure governor; 5. Alternator set with voltage regulator on end of shaft.

# The Thames Crossing Towers

THE erection of the two towers for conveying two three-wire 132-kV circuits across the Thames from Barking power station to the Northfleet sub-station of the Central Electricity Board is now nearly completed. The towers are placed on the north side at Dagenham, close to the new Ford Works, and on the south in the grounds of the Woolwich Arsenal. The crossing itself comprises two main suspension towers, each 487 ft. high, with an anchor tower at each end 105 ft. high. The respective spans are 1,500 ft., 3,060 ft., and 1,500 ft., and a minimum clearance at high water of 250 ft. is provided.

Each conductor has a 91-wire strand, the diameter of each wire being 0.0856 in. The seven centre wires are of cadmium copper and are surrounded by eighty-four wires of phosphor bronze, giving an overall diameter of 0.942 in. At the suspension towers the weight of each conductor is supported by a double string of disc insulators, each string having eleven discs; at the anchor towers the strain of each conductor is taken on triple tension, eleven-disc strings of insulators.

It was necessary to pile the foundations for all towers, and in the case of the suspension towers, from twelve to fourteen 60-ft. reinforced concrete piles were required for each leg. The base of these towers at ground level is 120 ft. square. The structures are riveted for 400 ft. up, the top portion, which includes all the cross arms, being galvanised and bolted.

A stairway provided with hand rails enables an easy ascent to be made for 387 ft., the remaining distance having to be negotiated by means of a combination of stairways and ladders. The design of the structures is such that if necessary at some future date a lift can be incorporated. There is over 300 tons of steel work in each of the towers. At the time of going to press the north suspension tower has already reached its total height of 487 ft., while the south suspension tower has reached 382 ft.

The main contractors are Callender's Cable & Construction Co., Ltd., the tower designers Messrs. Milliken Brothers, Ltd., and the constructors and erectors the Pearson & Knowles Engineering Co., Ltd. Views of the towers appear on page 287.

# The Refining of Nickel. By C. C. Downie

THE electro-metallurgical refining of nickel has proved to be one of the most complex and elusive systems of electrolysis of modern times. Several large metallurgical companies have tried electrolysis, but almost without exception have experienced great difficulties, and in many cases have been compelled to abandon the system in favour of pyro-metallurgical processes.

The principal difficulty with nickel is that both copper and iron are deposited before it, and these represent impurities which are invariably present. Apart from this, many nickel deposits show a marked tendency to peel off in thin flakes or shavings when worked on the large scale, which makes it difficult to produce a thick coherent layer of the metal.

The principal point in favour of electrolysis is that precious metals are usually present in small quantities, and by the direct system of smelting are, as a rule, completely lost. One of the chief sources of revenue of many of the large nickel firms is their precious metals recovery plant.

## Some Reactions

Nickel and iron differ from other metals in that they have much lower hydrogen overvoltages and have considerable irreversibility of disposition. Tables were originally made out to account for the amount of polarisation likely to be experienced. As the temperature of the bath rises, polarisation decreases, but the hydrogen overvoltage behaves similarly. Accordingly, whatever may be the temperature or current density, hydrogen will be evolved to a notable extent; hence the current efficiency of nickel deposition will be low. Further, there is a low limit set to the acidity of the electrolyte below which basic salts would separate out.

The electrolytes used are either hydrochloric or sulphuric acid solutions. The deposits of nickel in either case are reduced by increased temperature of the bath or nickel salt concentration, but are increased by additional current density.

The disposition of deposits to peel off is similar to the phenomenon observed in experimental work on iron electrolysis. This peeling or flaking is more pronounced when iron is present as an impurity.

The unfortunate point is that iron deposits more easily than nickel, and is an impurity which is invariably present. Consequently the first layers contain a larger proportion of iron than do the subsequent layers, and hence set up strains which cause peeling to occur. In a similar manner hydrogen, if distributed unevenly in successive layers of the metal, is reckoned also to act in this way.

When thin starting sheets are employed the tendency is for the cathode to so bend that it becomes concave towards the anode, which means that the deposit is contracting. Where more strongly acid solutions are used and hydrogen gas more markedly evolved, the bending is much less than when weak acid electrolytes are employed, but raising the nickel concentration and temperature also reduces the contraction. While heavy deposits are enhanced by increased current density, contraction is reduced by lowering the amperage.

## Superposed Alternating Current

The application of superposed a.c. has in many ways almost revolutionised modern electro-metallurgy, since it has made possible the working of processes which in many cases were considered to be beyond the scope of electrolytic science. At present this appears to be the likeliest system of overcoming the difficulties which surmount the nickel problem.

When superposed current is applied, nickel dissolves freely in solutions which otherwise do not attack it. The solution of the nickel is enormously facilitated and the anodes dissolve quietly and rapidly. Excessive amounts of impurities cause spongy or scaly deposits, and such in some cases are beyond the scope of the rectifying influence of the superposed current. The most harmful impurities are copper, manganese, iron, zinc, and lead.

These, as pointed out by Riedel, are in the above order of increasing harmfulness to the coherence of the deposit using chloride electrolytes. In the smelting of the raw ore, however, these impurities are almost completely removed with the notable exception of iron.

Recent publications in American metallurgical literature have shown that a new system of smelting provides an alloy of iron and nickel direct from the ore, and hope is entertained that by means of applying superposed a.c. the pure metal may be recovered by another short cut. Nickel readily becomes passive, even in an acid solution, while in a neutral electrolyte passivity sets in at a very small current density.

Pure nickel requires the highest polarisation and becomes passive most easily, but ordinary cast or rolled nickel corrodes much better, partly due to the presence of impurities and partly to the irregularity of the structure. At somewhat high current densities a point is reached at which nickel solution practically ceases, and the potential rises rapidly up to the value at which the evolution of oxygen can occur.

When in this condition the nickel behaves practically the same as a platinum anode in solution. Superposed a.c. largely eliminates passivity and other retardation phenomena, and permits of working at much greater current densities.

The most satisfactory deposits are secured by using a moderately high temperature, a high nickel concentration, a current density not too high, and a means of keeping the hydrogen ion concentration controlled within narrow limits.

**The cell room of the Port Colborne electrolytic nickel refinery of the International Nickel Co. of Canada, Ltd., where 24,500 tons of electrolytic nickel are produced per annum**

## Practical Points

The following details are taken from a plant arranged for experiments on the large scale, and equipped on the latest lines with superposed alternating current connections.

The metal to be electrolysed is melted and cast into anode moulds, and may contain numerous impurities. The anodes are enclosed in special canvas bags in order to retain the slimes, which contain the precious metals, etc. The cathodes are made of iron plates, protected by a layer of graphite, made by applying a thin wash of graphite and water. The deposited nickel sheets cleave readily from the graphite surface, while the graphite prevents undue corrosion of the iron.

Several tanks are connected in series and form one unit, which is served with d.c. by an electric motor-generator. As nickel is deposited on both sides of the iron plates each plate gives two sheets of nickel. The plates are arranged in parallel, between fifteen to twenty plates being suspended in each tank. The electrolyte is maintained at 4 per cent. nickel, and kept slightly acid with sulphuric acid. Prior to the introduction of superposed a.c., a pressure of 3 to 4 V per tank was used, and a current density of 8 to 10 A per square foot. The electrolysis was continued until the deposit reached a thickness of about ¼ inch, when the nickel deposits were removed from the iron plates and weighed about 20 to 25 lb. on each side.

This occupied many days, but the superposed current reduced the time materially. A considerable amount of anode scrap, sometimes as much as 30 per cent. or more, accumulates. This is washed free from the precious anode slime, and used to regenerate the electrolyte.

# Electric Motors on the Farm. By R. J. Chapman

## Some indication of their numerous applications

PROGRESSIVE farmers, growers, stockbreeders, &c., are already making considerable use of electricity wherever supplies are available at reasonable rates.

Apart from the obvious market for electric lighting and domestic appliances for the farmhouse itself, by far the largest field for electricity in agriculture to-day is the driving by electric motors of barn machinery, dairy machinery, and water and other pumps.

The robust and simple squirrel-cage induction motor for 3-phase supplies and the repulsion-induction type for single-phase supplies will, if intelligently applied, be found entirely satisfactory for most, if not all, of the motor applications.

The conditions under which the bulk of the barn and dairy machines operate are certainly no more arduous than those obtaining in the average manufactory, and highly successful motor applications ought to be secured without difficulty if the following points are observed :—

(1) Most of the machines will be run but an hour or so at a time, with intervals between that may be anything from a day to several days, or even weeks, duration. This means that " group " driving, when practicable, will be the general rule, as the saving in power that would be effected by individual drive is usually insufficient to offset the extra capital cost. The better electrical efficiency of the individual drive seldom appeals to the farmer, whose idea of efficiency takes into account of the cost of the apparatus, its running costs, and its general usefulness.

(2) The ease of starting makes a very big appeal to the farmer, who, after a little experience, soon finds that it will pay him to do by electric machines many of the short-time jobs, such as wood sawing, that were formerly done by hand, it previously being too much trouble to get the engine going for short jobs. This means that a further machine or so is likely to be added to the group, and a motor of sufficient h.p. to take care of this possibility should be selected.

(3) Farming is not an exact science, and there is more scope for the expression of individuality in running a farm than in running a factory, so it is essential to respect the views of the farmer on any proposed scheme of electrification submitted to him.

Profound knowledge of farming operations is not essential, but the particular methods and sequence of operations already in force must be ascertained before any practicable scheme can be prepared.

### Barn and Dairy Machinery

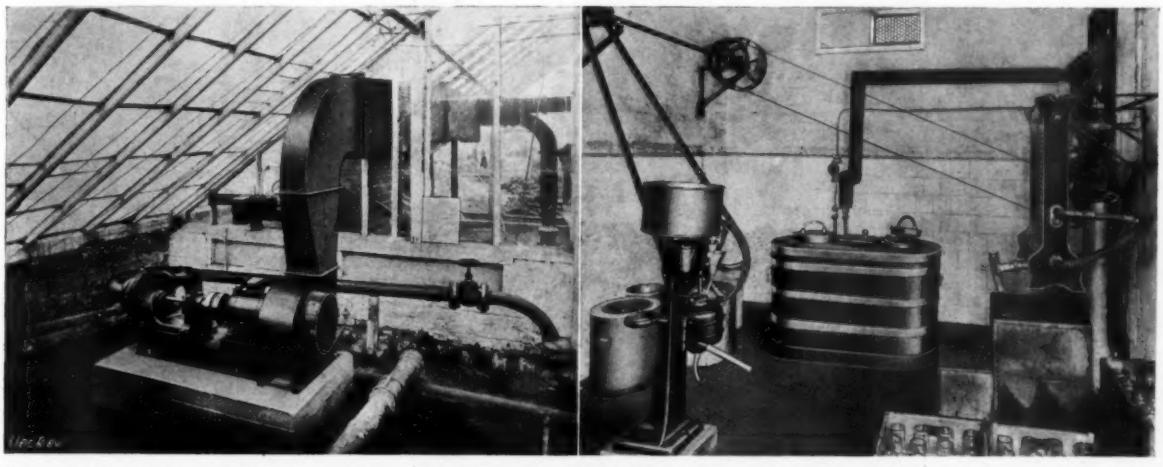
Barn machinery is a general description covering such food preparing machinery as grinding and crushing mills, chaff-cutters, root cutters, and cage breakers. Practically all farms supporting live stock have at least one example of each of these machines, which will be found belted as a group to a line-shaft driven by an internal combustion engine.

It is extremely simple to replace the engine with an electric motor, as no alteration to the grouping of the machines is necessary. A 5 to 7½ h.p. motor meets the requirements of the average medium size group, as it is seldom necessary to run more than two or three machines at once. A motor speed of approximately 1,000 r.p.m. will in most cases be sufficiently low to enable a satisfactory drive to all machines to be obtained with the minimum of changes to existing pulleys.

In the production of milk, butter, and cheese, the electric motor scores heavily, as it is the only driver that is entirely odourless in operation, which is a point of major importance in the production of any food for human consumption. This means that the motor can be fixed in the most advantageous position with respect to the driven machines, whereas an engine, for hygienic reasons, must be housed apart to avoid contaminating the product.

In the average dairy will be found such machines as a milk cooler, separator, bottle washer and water pump, butter churn, refrigerator and cold room, and, if cheese making is also carried on, there will be a curd grinding mill and perhaps a hoist.

Individual motor drive is economically possible with some of these machines, as a fractional-h.p. motor is generally ample for the separator, churn, and bottle washer. There may be a milking machine of the vacuum pipe-line type and certainly barn machinery which can be very readily converted.



**Left: " Keith-Blackman-B.T.-H." greenhouse heating plant. Right: Cold room and freezing machinery and milk separator driven through line shafting by a 2-h.p. motor**

### Pumps and Elevators

The amount of pumping done on farms is often surprising.

The electric motor is the complete solution of both large and small pump drives, as, in addition to being cheaper to install and run than an engine, it takes up less room, runs quietly, and is started without effort.

Less prominent, but by no means negligible, motor applications include elevators for hay, corn, or straw, threshing machines, ensilage cutters and blowers. As these machines are only in use during the hay and corn harvests, a portable motor that can be readily belted to any of the machines makes the most economical drive.

A threshing machine may need from 12 to 20 h.p. and an ensilage cutter from 7½ to 12 h.p., but if neither is used then a 5-h.p. portable motor is likely to be ample for the elevator and other duties.

**A B.T.-H. portable 2-h.p. motor elevating hay**

Cattle groomers and clippers, sheep shearing machines, portable milkers, egg graders, &c., of the type driven by small electric motors have no competitors in convenience and reliability.

Commercial greenhouse owners are finding that an electrically driven combined fan and circulating pump reduces fuel costs and at the same time allows of better temperature control.

# Furnace Hoist Equipment

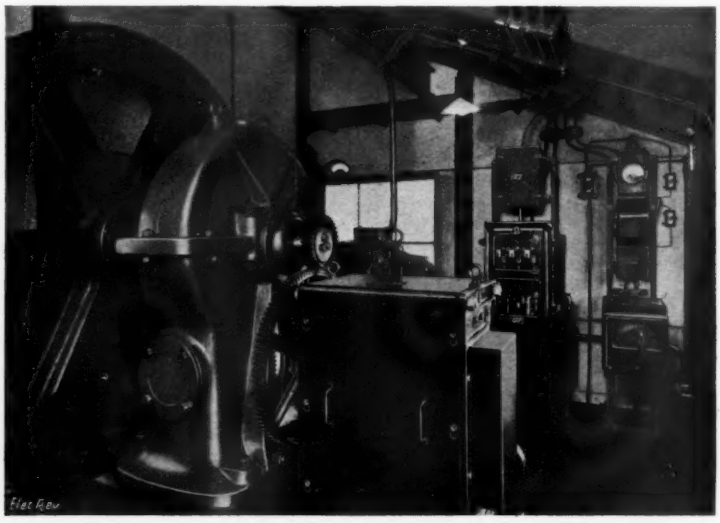
## Modifications at Kettering Iron and Coal Co.'s. Works

THE auxiliary equipment of the furnaces of the Kettering Iron and Coal Co., Ltd., Northamptonshire, has recently been comprehensively electrified.

One of the most important features of the extensions is the electrically driven furnace barrow hoist, which has the advantages of ease of control (so that unskilled labour can be used), rapid yet smooth acceleration, even retardation, and automatic and accurate decking. The operator simply starts the cage, after which the sequence of operations is entirely automatic.

The equipment comprises a 60-h.p. d.c. hoist motor, controlled by a 40-kW Ward-Leonard motor generator, which is connected to a 460-V, 3-wire, d.c. system supplied by a 250-kW geared turbo-generator, a 300-kW reciprocating set being available as stand-by.

The Ward-Leonard motor generator is automatically controlled by a master controller and an accelerating drum switch driven from the winder shaft. Referring to the diagram the master controller A is operated through rods by a handle at the foot of the hoist. For normal working this controller has two main operating positions. On moving the controller over to the "raise" position, the exciter contactors E close, and the generator C is excited by a weak field current, thus starting the hoist motor D. Immediately the hoist begins to move the accelerating drum-switch B is operated by the winder shaft and progressively raises the field current in the generator to its full value, so that the hoist motor is automatically accelerated to full speed.



View of winding gear showing also control panels for 60-h.p. "Witton" hoist motor and 40-kW Ward-Leonard motor generator set

As the hoist reaches the limit of its travel the accelerating drum switch automatically retards the hoist motor by reducing the field current of the generator C, until finally a limit switch is tripped which opens the field circuits of the hoist motor and the generator, and applies the solenoid brake F to the hoist. For lowering the hoist, the same sequence of operations takes place by moving the master controller over to the "lower" position.

### Accurate Decking

Each barrow weighs 7¼ cwt., and will take 15½ cwt. of ironstone, giving a total weight of 46 cwt. If coke is raised the total weight is 27 cwt. For decking a set of three con-

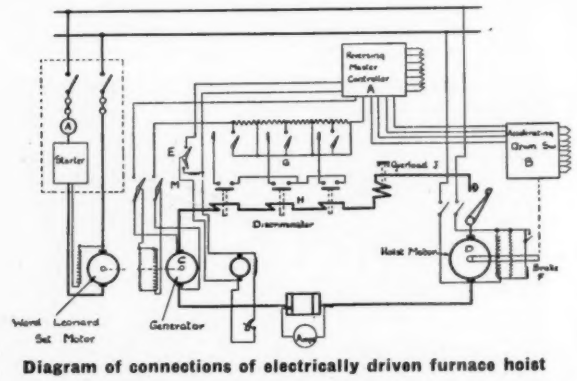



Diagram of connections of electrically driven furnace hoist

tactors G, together with load discriminating relays H are provided. Each contactor is energised by the operation of its relay, and short circuits a small resistance in the field circuit of the Ward-Leonard generator. By this means the generator voltage and the motor output are automatically increased with the load, so that the hoist travels always at its maximum speed and decks accurately.

Protection is afforded by an overload relay J in the hoist motor circuit, and an emergency switch K, which is mounted immediately below the operating handle of the master controller A. Operation of either trips the main and exciter contactors and automatically applies the solenoid brake.

In order to obviate any risk of creeping due to residual magnetism, a small double-pole double-throw contactor M is provided. When de-energised, this contactor connects the field circuit across the generator armature in such a manner as automatically to prevent any building up of voltage by the generator.

The hoist is automatically stopped should the supply voltage fail during any part of its travel. A further resistance is provided in the generator field system, which on restarting, can be cut out gradually by slowly operating the master controller, so that the motor can be accelerated to the speed corresponding to the position of the accelerating drum switch, after which the drum switch automatically controls the hoist. Under normal conditions this resistance is completely short circuited by moving the master controller to either of the main running positions. Electrical interlocking is arranged between the upper and lower stages of the hoist.

Two banks of boilers, fired with rough cleaned blast furnace gas, supply steam at 60 lb. per sq. in., and 150 lb. per. sq. in. respectively. The 60-lb. per sq. in. steam is used for driving certain reciprocating blowing engines.

The 250-kW pass-out turbine takes steam at 150 lb. per sq. in., and carries its full load with all steam passing cut at 60 lb. per sq. in., thereby supplementing the steam from the 60 lb. per sq. in. boilers. It comprises two velocity stages, each with two rows of moving blades.

### Steam Expansion

The first stage expands the steam from 150 to 60 lb. per sq. in., and the second from 60 lb. to atmospheric pressure. All steam from the first stage passes out into the 60 lb. per sq. in. steam main. The steam to the second stage is admitted through a reducing valve (under the control of the speed governor), which opens automatically if the steam raised in the high-pressure boilers is insufficient to carry the works load in the first stage or if there is a surplus of steam from the 60 lb. per sq. in. boilers. The reducing valve is controlled by an Arca regulator which tends to maintain constant pressure in the low-pressure steam main.

The principal electric motor drives include two slag breaking plants, tar macadam plant, workshops, service pumps, boiler feed pumps, &c.

The electrical equipment for the hoist, and also the d.c. generators, switchgear, and motors referred to, were designed and manufactured at Witton Engineering Works, by the General Electric Co., Ltd., while the pass-out turbine was manufactured at the company's Fraser & Chalmers engineering works.

Acknowledgment is due to Mr. G. H. Johnson (managing director, Kettering Iron & Coal Co., Ltd.) for permission to publish the information and illustrations contained in this description.

## Standard Specification for Tungsten Lamps

The most important revisions incorporated in the 1932 edition of the B.S. Specification (No. 161) for tungsten filament lamps are in connection with the table referring to dimensions of lamps for general service. The valuable work done prior to the issue of the 1930 specification, which enabled exact dimensions for lamps up to and including the 100-watt size has now been completed by specifying exact similar dimensions for the larger lamps from 150 to 1,500 watts. For general lighting services the dimensions adopted have been accepted by lamp manufacturers all over the world.

This marks a real achievement in standardisation. Naturally world-wide agreement meant some concession on the part of the B.S.I., but substantially the existing British standards have been adopted for all sizes, except the 200- and 1,000-watt, for which lamps the dimensions and light centre have been reduced.

Beyond this important step forward alterations are comparatively trivial, the chief being a clarification of the clauses referring to testing.

Copies of this specification may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, S.W.1 (5s. 4d. post free).

# Some New Electrical Instruments

A LARGE variety of electrical instruments to meet the needs of mainsmen and testers is being put on to the market by Messrs. Nathan & Allen, Ltd., 131, Victoria Street, S.W.1.

The "Hurdy Gurdy" cable fault localiser is designed on the principle of the Thomson double bridge for locating any kind of earth or short circuit. The advantage claimed for it over instruments constructed on the Wheatstone bridge principle is that a sound return lead is usually unnecessary. It is essentially a device for measuring low resistances, and gives the resistance of a faulty core from the testing end as far as the fault.

When taking readings from each end, the results can be used as a ratio applied to the length of cable; if the test be made from one end only, the result divided by the resistance per yard of the cable gives the distance to the fault. An oak case, 20 by 15 by 7 in., weighing 26½ lb., contains the leads which have clips for gripping conductors from 1/18 s.w.g. to 1 sq. in. The accessories required are a galvanometer and a hand generator.

The instrument has a maximum reading representing 10 ohms. For a 0.007 sq. in. cable the range is over 1½ miles, and correspondingly more on larger cables.

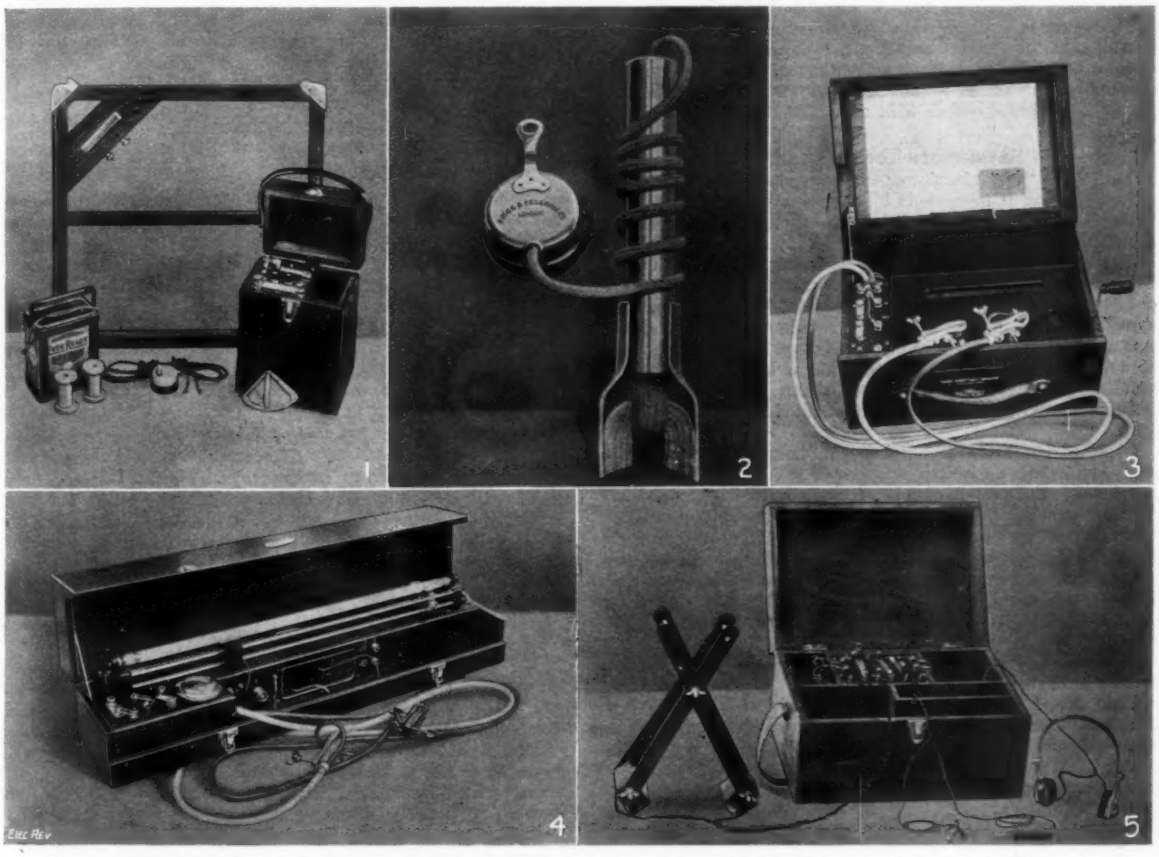
## An Armature Tester

The "Patten" armature tester comprises a high-frequency trembler type generator, operated by a 4-V battery, a pair of search coils in a caliper frame, a pair of telephones, and a spear. One search coil is connected to the secondary of the generator and the other to the telephones. When testing for an earth, a small brass V-piece, connected to a terminal on the panel, is placed on the armature shaft; the search coils span the two sides of the armature coil. Each commutator bar is touched by the spear until the faulty coil is indicated by absence of noise. The instrument is suitable for armatures up to 1,000 kW in capacity. Its weight is 20 lb.

The "P. & B." horseshoe coil determines whether a cable is dead before cutting, detects earth leakages, and differentiates between cables in a trench. It comprises a horseshoe-shaped core of steel attached to a cylindrical fibre handle. A winding on the core is connected to a condenser in the handle and to a telephone ear-piece. Its weight is 1½ lb. It is designed primarily for a.c. systems, but a d.c. supply will give an audible signal.

The "Sharman" main finder is designed to locate gas or water pipes, &c. It consists of a "generator," battery, search coil, depth indicator, and telephone. The "generator" converts current from a dry battery to low-frequency pulsating current, which is led to the pipe; its course is detected by the search coil. The depth indicator shows the depth of the pipe, at which point the sound is lost. The weight of the complete set is 18 lb.

A companion instrument is the "Sharman" box finder which detects small objects buried to a depth of 10 in., and larger objects at correspondingly greater depths. For tracing the position of lost underground 50-cycle cables the "P. & B." tuned search coil is put forward. This instrument (weighing 6 lb.) comprises an oak frame carrying a winching con-



1. The "Sharman" main finder; 2. The "P. & B." horseshoe coil; 3. The "Hurdy-Gurdy" cable fault localiser; 4. The "P. & B." self-calculating bridge; 5. The "Patten" armature tester.

**Some of the new instruments described in this article**

nected to a condenser and a telephone ear-piece. The sound diminishes or is lost at the fault.

## Fault Detection

The location of all kinds of faults in underground cables or overhead lines by unskilled men can be carried out, it is claimed, by the "Sharman" cable fault detector (weight complete 2¼ lb.). Current from a 4- or 6-V battery is converted to l.f. current with a special wave form, and is fed to the faulty core. Loss of, or change in, the pulsating sound indicated by a telephone search coil shows the position of the faults. This device is not recommended with sheathed or armoured cables.

The "P. & B." electric stethoscope for detecting leaks in water mains consists of a sensitive microphone connected to a dry battery and pair of telephones. A valve amplifier can be connected between the telephone and microphone to improve the signals if the leak is small or at a considerable depth. The amplifier is a self-contained unit and includes a single transformer-coupled valve working from a 3-V dry battery and a 66-V anode battery.

## Measuring Instruments

The "P. & B." range of measuring instruments includes a thermal maximum demand indicator for a.c. and d.c. systems. In this two flat coils of bi-metal strip are coupled at their

*(Continued at bottom of next page.)*

# Variable-speed Motors. By J. J. Chase, A.M.I.E.E.

## Advantages of the a.c. commutator machine

THE variable-speed a.c. commutator motor, despite the higher initial cost and lower efficiency as compared with the d.c. machine, has definitely economic applications at horse-powers between 50 and 250. Post-war experience has shown that it is as reliable, and that, generally, when the correct design of machine is installed, the maintenance is very little greater.

In modern factories remote control is now recognised as essential to ensure maximum production, and fully automatic equipment only will be considered. This gear for the a.c. motor consists mainly of air-break three-phase switches, with auxiliary interlocks and limit switches and push-button controls, whereas for the d.c. motor, main and resistance step contactors with timing devices are necessary. Also, if remote speed control is needed from more than one point, an automatic regulator must be installed. Experience has shown that control gear for the a.c. motor entails lower initial and maintenance costs, and occupies less floor space. Speed control and acceleration, which in some industries are important factors, are found to be smoother with an a.c. motor control.

### Favourable Terms Available

Generally, the large power consumer is offered the most attractive tariff if he accepts his supply at between 3,000 and 11,000 V. Under these conditions, the a.c. commutator motor shows many savings, both in the efficiency and the initial cost of the installation, for it is only necessary to install a step-down transformer and switchgear. The transformer can be placed outside, thus making a considerable saving in building costs, and the foundations are light. When using d.c. motors it is necessary to install some type of converting plant, working at a much lower efficiency, requiring a large weather-proof building, comparatively heavy foundations, maintenance, and, unless automatic sub-station equipment is installed, attendance.

To avoid loss from a complete shut-down of the plant for any considerable period, spare sub-station equipment is usually provided. Either the supply is taken through duplicate feeders or from a ring main, and the switchgear used is generally of the double busbar pattern. Transformers are generally duplicated or built up of banks of three single-phase units with a spare unit, and converting plant complete with switchgear is duplicated. By using a.c. commutator motors for some variable-speed drives, large savings are possible in spare sub-station equipment.

In the example given below, the plant under consideration is as follows:—

Plant No. 1, all d.c. variable speed drives: Three 150-h.p. d.c. 3 to 1 variable-speed motors working at an average of three-quarter full load at 88 per cent. efficiency; two 75-h.p. d.c. 3 to 1 variable-speed motors working at an average of three-quarter full load at 86 per cent. efficiency; and sub-station equipment consisting of one 500-kW 6,000-V synchronous motor generator, and one 500 kVA transformer bank.

Plant No. 2, a.c. and d.c. variable-speed drives: Three 150-h.p. a.c. 3 to 1 variable-speed commutator motors, working at an average of three-quarter full load at 85 per cent. efficiency; two 75-h.p. a.c. 3 to 1 variable-speed commutator motors, working at an average of three-quarter full load at 84 per cent. efficiency; and sub-station equipment consisting of one 100-kW, 6,000-V synchronous motor generator and one 1,000-kW transformer bank.

Common to both plants are: D.c. variable speed motors of 1 to 10 h.p., giving a load of 35 kW, and l.v. a.c. synchronous and induction motors, giving a load of 400 kVA at unity power factor.

### Electricity Consumption and Initial Costs

The annual consumptions of electricity for 6,200 working hours per annum are as follows:—

| Plant No. 1. | kWh. |
|---|---|
| 3 150-h.p. d.c. motors | 1,775,000 |
| 2 75-h.p. d.c. motors | 606,980 |
| D.c. load of 35 kW | 217,000 |
| Light-load losses of 500-kW m.g. set | 235,600 |
| Average load losses of 500-kW m.g. set | 99,200 |
| Lt. a.c. load of 400 kW | 2,480,000 |
| Light-load losses of 500-kVA transformer | 13,020 |
| Average load losses of 500-kVA transformer | 22,630 |
| Total Consumption | 5,449,430 |
| **Plant No. 2.** | |
| 3 150-h.p. a.c. motors | 1,835,820 |
| 2 75-h.p. a.c. motors | 619,380 |
| D.c. load of 35 kW | 217,000 |
| Light-load losses of 100-kW m.g. set | 46,500 |
| Average load losses of 100-kW m.g. set | 11,160 |
| Lt. a.c. load of 400 kW | 2,480,000 |
| Light-load losses of 1,000-kVA transformer | 27,900 |
| Average load losses of 1,000-kVA transformer | 44,640 |
| Total Consumption | 5,282,400 |

These figures show a saving of over 3 per cent. in favour of the plant using some a.c. commutator motors, but large savings are shown below in comparing the initial costs of the two plants:—

| Plant No. 1. | £ |
|---|---|
| 3 150-h.p. d.c. motors and automatic control gears | 2,000 |
| 2 75-h.p. d.c. motors and automatic control gear | 860 |
| 500-kW m.g. set and switchgear | 2,200 |
| 500-kVA transformer and l.v. switchgear | 330 |
| | £5,390 |
| **Plant No. 2.** | |
| 3 150-h.p. a.c. motors and automatic control gear | 2,000 |
| 2 75-h.p. a.c. motors and automatic control gear | 950 |
| 100-kW m.g. set and switchgear | 500 |
| 1,000-kVA transformer bank and l.v. switchgear | 550 |
| | £4,000 |

### Reduction in Spare Equipment

The cost of equipment common to both plants has not been considered; neither has the transformer h.v. switchgear, as this would, in both cases, be installed for a definite rupturing capacity, depending upon the supply company's equipment. Building costs have not been included, as should these be part of the factory, and the saving in floor space, &c., would vary widely with different classes of product and locations. This saving of £1,390 in favour of the plant using some a.c. variable-speed motors is further increased when the cost of spare sub-station equipment is considered. In the plant using all d.c. variable-speed motors, one 166-kVA single-phase transformer at £85, and one 500-kW m.g. set and switchgear at £2,200 would be necessary as spares, whereas, in the plant using some a.c. variable-speed motors, only one 333-kVA single-phase transformer at £150, and one 100-kW m.g. set and switchgear at £500 would be necessary.

This shows a total saving of £3,025 in initial plant costs, in favour of a plant with some a.c. variable-speed motors. If a definite class of manufacture were selected and building costs and floor space considered, this saving would be greatly increased. Distribution costs and losses have not been taken into account, as these would vary greatly with different factories, but probably the a.c. case would have a slight advantage over the d.c., as experience has shown that above a certain voltage maintenance tends to increase on d.c. motors and control gear.

## Some New Electrical Instruments *(Concluded from preceding page)*

centres by a light rod; the outer end of the actuating coil is fixed, that of the compensating coil carrying the needle. Near the actuating coil is a small heating element through which the current passes. Time lag is obtained by the insertion of a heat-proof brick behind the heater; by varying the shape and size of the brick the time-lag can be varied between 8 and 30 min. Transformers with especially matched impedances can be supplied when necessary.

A capacity measurer, for locating open circuits or dead ends in cables, comprises a standard capacity and an ebonite panel upon which is mounted a scale of ten parallel lines, over each of which is stretched a "Constantan" wire, connected together to form a single 7-ft. slide wire. Readings are taken by sliding a "feeler" along the wire until there is no sound in the telephone. The capacity measured from one end to the fault, divided by the capacity per yd. of cable, gives the actual distance to the fault calculated in yards.

A self-calculating bridge for carrying out the Murray loop test simply comprises a double slide wire mounted between supports on a panel; one half represents the faulty and the other the return conductor. Three sliders represent the lengths of the faulty and sound conductors, and the position of the fault to the same scale. A 36-V battery is provided. The net weight of the instrument is 33 lb.

Sag in overhead lines may be determined by a steel sag meter which measures the distance between an imaginary straight line joining the ends of the span and the point of maximum sag, the foresight (a triangular frame) is combined with a backsight. Accuracy with open sights is claimed to be within one inch at a distance of 250 ft. When used at a higher altitude than the line the sights may be reversed. The net weight of the sag meter is 19 lb., and of the tripod 8 lb.

## A New Wireless Institute

The Institute of Wireless Technology was registered on August 8th as a company limited by guarantee without share capital and with not more than 1,000 members. Its management will be vested in a council and its object is the promotion of the general advancement of wireless technology.

# Correspondence

*Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession*

## Arc Welding

Arc welding plays an important part in maintenance at the works at which I am engaged, and the following practical notes on some of the repairs carried out under my supervision indicate the considerable savings possible through its adoption.

We use a number of cylindrical cast-iron boxes, each weighing about 1,000 lb.; these are subject to high temperatures and heavy wear on the insides. These expensive boxes were formerly scrapped as soon as they became badly pitted, but now the holes are filled by the deposition of beads of metal and ground to the original level by a portable corundum wheel. M.W.P. electrodes are used. Broken flanges on cast-iron cooling rings are also repaired by arc welding with the same type of electrode.

Plough shafts are subject to high temperatures and also to drag. They call for daily repairs. The worn ends are rebuilt by depositing on them beads of metal 90 degrees apart, so as to equalise as far as possible the stresses. They are then machined to the desired size. The electrodes used are Litex as a base and M.W.P. special B cast-steel on the surface, which are easily machined and give a tensile stress of 30 to 35 tons.

Gas-producer water rings dealt with are ⅜ in. m.s. plate and have diameters of 5 ft. internal and 6 ft. 2 in. external; the water opening is 8¼ in. by 7 in. Leaks develop due to the fitting of the plate. In carrying out the repair, a piece of plate surrounding the leaking spot is cut out and a new piece is welded in. The electrodes used are M.W.P., Litex and Genex.

Other repairs carried out by arc welding include gas-producer mounts, armature shafts, steel structures (instead of resorting to riveting), elevator and conveyor tubes, and cast-iron valves.

J. JAMES.

Clydach, near Swansea, *August 19th.*

## Henley's Jubilee

Will you permit us to draw your attention to an error which has occurred in the article "Supply in its Infancy" on page 263 of your current issue, wherein reference is made to the jubilees of various electrical companies, and in which a sentence appears "Henley's jubilee also falls later"?

Actually the jubilee of W. T. Henley's Telegraph Works Co., Ltd., was in February, 1930, because the company was incorporated on February 21st, 1880. The company can, however, claim a much longer association with the electrical industry. William Thomas Henley, who was the first managing director of the present company and who died in 1882, was an electrical manufacturer—first of instruments, then of fine wires and subsequently of electric cables, particularly submarine cables, since the year 1837.

Mr. Henley was called upon to give evidence before the Joint Committee on Submarine Cables in 1859, and the findings of that Committee were "presented to both Houses of Parliament by command of Her Majesty" in 1861. In the course of his evidence he was asked how long he had been an electrical manufacturer and he answered: "Twenty-two years." This takes the date back to 1837, and on that evidence we have always claimed that this company has been connected with the electrical industry on the manufacturing side since 1837, and with the manufacture of electric cables since electric cables were first made.

You will thus see that considerable injustice is done to us in the paragraph referred to, and I feel sure that with your usual desire for the strictest accuracy you will have this matter adjusted by the insertion of this letter.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.
W. A. Moore.

London, E.C.1, *August 19th.*

[We are pleased to publish the above correction.—EDS. ELEC. REV.]

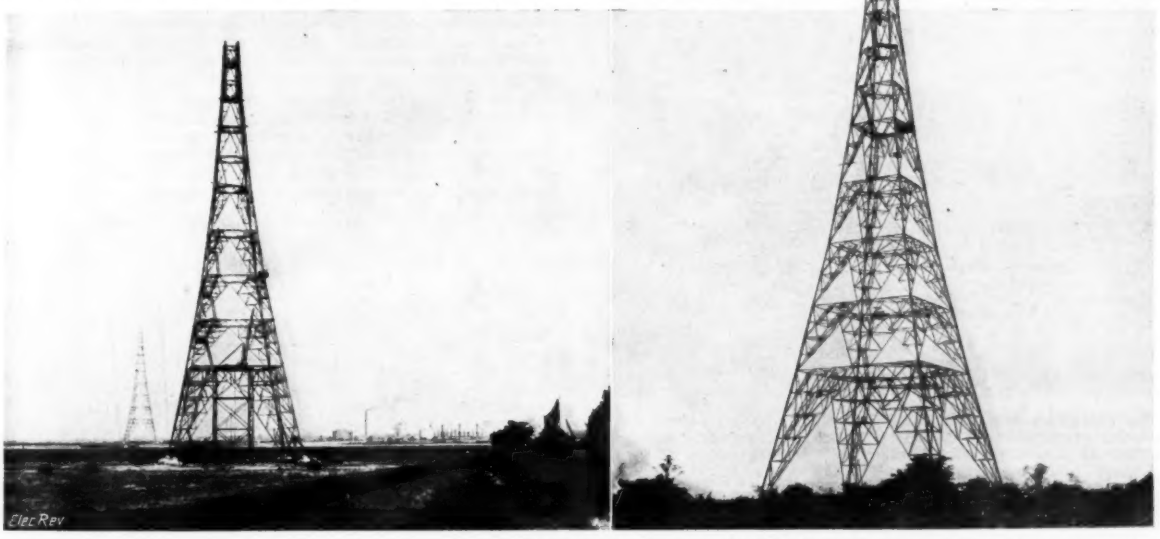
## Lighting from Power Points

A letter on this subject appears in the ELECTRICAL REVIEW for August 12th.

If the writer (Mr. P. O. Wittey) or other engineers interested care to communicate with me personally or through your columns I may be able to pass on an idea I have conceived to check this evil. The device has considerable flexibility and may be variously adapted to prevent illegal usage; to prevent further usage of the point until the company has been notified; or to register the amount in use at the time of illegation operation. As no complicated mechanism is involved, production cost may reasonably be expected to be within commercial limits.

F. TAYLOR,
Sedbergh Electric Co.

Sedbergh, Yorks,
*August 17th.*



**The Grid Crossing over the Thames (see page 281): Left, the south tower at Woolwich Arsenal; right, the north tower at Dagenham, Essex**

In Mr. Gage's letter in your issue of August 19th a suggestion is made which may be of interest to accessories manufacturers, but even so it would seem that the difficulty of imposing such a device upon consumers would still remain.

It occurs to me, however, that meter manufacturers may be able to incorporate some form of thermostat calibrated to work upon a predetermined minimum current in meters intended for use on power circuits, and if this suggestion is worthy of attention I shall be glad to hear more about it. Such an arrangement, however, would not be without its difficulties, because in such control of small domestic power circuits, where appliances are wound for taking less than the predetermined minimum current (for instance, certain wireless sets), contention would arise as to the correct rates of charge, especially in view of the popular understanding that anything which cannot be regarded as "lighting" is definitely "power," and in the absence of any special charge may be paid for at power rates.

P. O. WITTEY.

Seaton, Devon, *August 22nd.*

I do not agree with the suggestion of Mr. C. F. Gage of a complicated plug to stop the misuse of power points for lighting; a far better plan is the adoption of an all-in method of charging in London, enabling electricity to be used for any purpose; the heating and lighting circuits could still be separate.

Gas companies only install one meter for all purposes. Why cannot electricity supply authorities do the same? I know of a small struggling butcher here in Bermondsey who has four electricity meters and two maximum-demand meters, one for outside lighting, one for inside, one 480-V power meter, and one for 240-V power. He has to pay about 15s. per quarter meter rent.

Why all this complication of circuits, expense of meters, &c., in 1932 when there is always a day load of some kind,

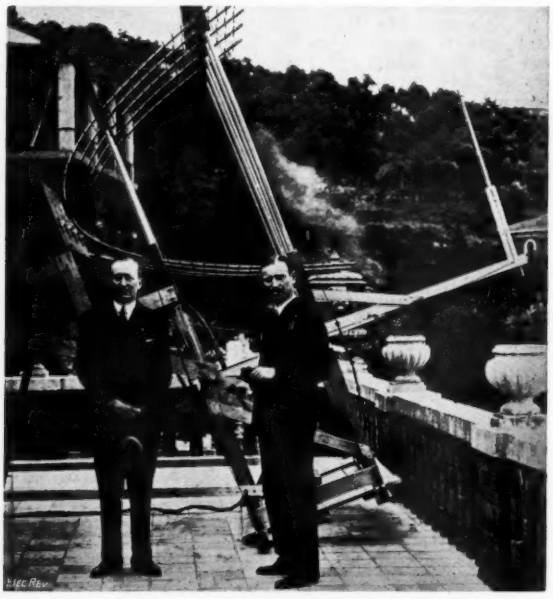
which was not the case thirty years ago? Is it not time that the Electricity Commissioners aimed at one common rate? I believe it would increase the general use of electricity.

Bermondsey, S.E.1, *August 22nd.* E. J. ARNOLD.

## "The Curse of Parochialism"

After reading the letters from Mr. Pink and Mr. Sayers one would say that whether the question of parochialism is a curse or a benefit depends very largely on the chief engineer.

Mr. Pink certainly brings forward a very sound point when he says that local production eliminates electrical transmission and this very frequently makes the cost of distributed electricity cheaper than the grid system. Unfortunately for Mr. Pink's point, however, a large number of parochial undertakings are not properly organised and so are unable to supply



**The Marchese Marconi (left) with his new ultra-short-wave wireless equipment with which he has succeeded in sending messages a distance of 168 miles on a wavelength of 57 centimetres**

electricity without a lot of irritating regulations, some of which are literally a handicap to British manufacturers.

To give concrete examples one can mention the high efficiency of the Wimbledon supply as compared with the inefficiency at one time of another municipal undertaking not many miles away. It is quite likely that the latter type of supply was the reason for the grid system; if all stations had been as efficient as Wimbledon the grid would not have been necessary. J. M. SEDDON.

London, W.C.2, *August 20th.*

## Suggested Electrical Engineers' Club

Mr. Pegg's proposal for an Electrical Engineer's Club is most interesting and has my fullest support. Mr. Fennell's remarks also are very much to the point. There is yet one point that so far no one has touched upon—that is, how admirable it would be for the engineer who has been abroad on foreign contracts to know when he lands in this country on four to six months' leave that there is somewhere he can go to and arrange to meet his old friends, or where he can get his meals until he gets the hang of his new surroundings.

During my travels abroad I have often heard this subject brought up, both by Englishmen and foreigners. They ask why there is no Electrical Engineers' Club, as the I.E.E. building always gives them the impression of entering a tomb.

CLINTON CATER, A.Amer.I.E.E., Assoc.I.E.E.

Bude, Cornwall, *August 21st.*

## The Effects of Electric Shock

Some years ago I had occasion to use a small portable electric grinding machine and as this machine had the habit of becoming uncomfortably warm after being in operation for some time, I put my two hands on the body of the machine before lifting it off the bench in order to see whether it was warm.

Upon touching the machine I felt as though I had received a terrific blow between the shoulders and it was several seconds before I realised that I had received a shock. Contact with the machine was only momentary, one hand on the body of the grinder and the other in contact with a bare portion of the lead-in, which had become uncovered.

I was on a wooden floor and wearing rubber soles on my boots, so that the full shock was apparently through both arms. The current in question was 230 volts a.c.

No effects were noticeable at the time once I had recovered from the surprise and realised what had happened, and this took a few seconds.

The following day I was off work as I was sick and giddy when on my feet. This passed off later and I was able to resume work the day after. No further symptoms were present. My hands were not burned to any appreciable extent.

D. R. C. LINDSAY.

Kilmarnock, *August 17th.*

## Consumers' Suggestions Invited

The idea of collecting suggestions from members of the public is excellent, and readers will no doubt look forward with keen interest to ensuing correspondence.

Referring to "Protonius's" letter, and his plea for a "small oven . . . . as an auxiliary to the ordinary cooker," I wish to call attention to the little "pot-type" table cooker made by the Ever-hot Electric Co., Ltd., 9-15, Oxford St., W.1.

The "E.C.10" model has played an honourable part in our home for two-and-a-half years. It frequently cooks a complete dinner of the "stew and boiled sweet" variety for four persons, with a consumption of less than one kWh, and is used almost daily in the preparation or warming-up of meals for the by-no-means-punctual bread-winner. "Protonius" may find this just the appliance he is looking for.

Manchester, *August 17th.* W. E. S.

## A Missing Negative

In your issue of August 19th you publish a very interesting article on the grid. I have had cause to complain of the confusion which prevails in many quarters as to the position created by the setting up of the grid, and it is therefore with all the more pleasure that I congratulate you on your article.

I would, however, call your attention to the paragraph towards the end of the article which begins "Supplies will also be more readily available where none now exist as undertakings will not fear to start to distribute in sparsely populated areas if they are handicapped by the capital charges on generating plant during the early stages." Presumably a double negative is needed.

PERCY E. RYCROFT,
Chief Engineer and Manager,
*Electricity Supply Department.*

Great Yarmouth, *August 22nd.*

[Our correspondent is right; "not handicapped" was what was meant.—EDS. ELEC. REV.]

## The Date of the Fair

I learned from a *Reuter* telegram in yesterday's paper that it has been decided to hold the British Industries Fair again in February next year.

I am coming on leave to England next year and I am looking forward to a pleasant busman's holiday. I naturally should like very much to visit the Fair, but I am certainly not coming to England to be frozen in February.

As the Fair is designed to attract overseas visitors, I suggest that there should be an agitation started to have the date of the Fair moved on to April at the earliest, or preferably May or June. G. BARNES.

Bombay, *August 5th.*

## "Electric" Fires

Adverting to your leaderette in the current issue of the REVIEW, regarding our old friend (or should I say enemy?) the Press reporters' short-circuit, I think that you will be interested in the enclosed Press version of a fire which destroyed a yacht. The fire apparently occurred when there was no one on board and so, in the absence of any obvious indication of the cause, it was ascribed to the usual "short-circuit."

Similar reports are becoming too common among certain of our daily newspapers which are usually associated with the higher order of journalism, and a remedy such as you have indicated is undoubtedly long overdue. Perhaps the Press could be persuaded to engage electrical correspondents, a move which I believe is fully justified in view of the national importance of the electrical industry. This would have the effect of enhancing the status of the industry by ensuring that correct and informative items of electrical news and interest were given to the public, whom the E.D.A. is strenuously endeavouring to train to be electrically minded.

London, S.E.2, *August 22nd.* A. E. JUDGE.

## All-electric Houses at Stoke

Mr. C. H. Yeaman (city electrical engineer, Stoke-on-Trent) has sent us the following information regarding the sixteen all-electric houses built in Avenue Road, Shelton. The last eight were erected during 1929-30, and have been occupied for nearly two years. The last annual figures were:—

| | KWh consumed. | | | |
|---|---|---|---|---|
| | Total. | Average per house. | Largest per house. | Smallest per house. |
| Lighting ... ... ... | 3,129 | 196 | 259 | 110 |
| Heating and cooking ... | 58,395 | 3,650 | 8 461 | 1,068 |
| Water heating ... ... | 42,498 | 2,656 | 3,824 | 1,437 |
| Total ... ... ... | 104,022 | 6,502 | 11,561 | 6,025 |

The average cost per week for all the houses was 6s. 9d.; for those with one fireplace, 6s.; for those without a fireplace, 8s. 7d. The average annual cost per house was £17 12s. 3d. at 0.65d. per kWh.

# New Apparatus and Devices

## for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

### An Electric Resistance Tube Soldering Machine

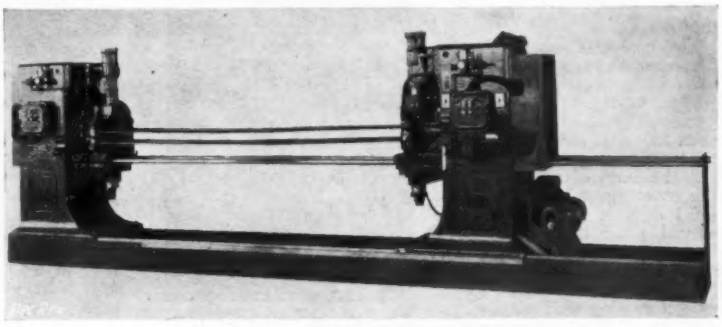
A special application of direct heating by the electrical resistance method, recently developed for the rapid soldering of parts consisting of from three to twelve copper tubes on which are assembled a large number of flanged fins, is embodied in a machine produced by the THOMSON-GIBB ELECTRIC WELDING CO., Bay City, Mich., U.S.A.

Each fin must be thoroughly soldered to each condenser tube for good thermal contact. The tubes to be soldered are well coated with solder, the fins assembled, soldering flux applied, the complete unit clamped in the machine, and the current switched on. Clamping of the work is by means of air cylinders and all the clamping jaws are adjustable so as to provide for uniform pressure and distribution of current to all tubes to ensure equal heating.

The unit actually consists of two machines, one being fixed on to the base and the other adjustable along it through a distance of about 10 ft. by means of a motor-driven worm-reduction unit, spur gears and rack. The motor has reversible drum control. Adjustable time relays are provided to give definite timing.

Each machine of the duplex unit carries its own transformer, one side of each secondary being connected to heavy bus-bars which form one side of the circuit, the work being heated forming the other side of the circuit.

This method of correct heating by electrical resistance has applications to many similar classes of work besides soldering, such as heating for annealing, heat treating, heating for forging, pipe bending, &c.



The electric tube soldering machine

### New Pressure and Draught Instruments

These notes are concerned with three instruments recently introduced by the CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, London, S.W.1.

One is a sensitive, accurate and robust indicator, designed for precision measurements of low pressures or vacua. It contains no liquids and can be used to indicate either draught, pressure, reversion pressures, differential draught or differential pressures. The range may be selected within any desired limits up to a maximum pressure of 5 lb. per sq. in., and the scale, approximately 7 in. long, can be arranged to cover a minimum range of only one inch of water, thus enabling very accurate readings to be easily obtained.

A sealed chamber inside the instrument is divided into two compartments by a flexible metal diaphragm, and tubes are led from each side of the diaphragm to two external connections at the sides of the instrument case. When the instrument is used for measuring pressures or draught only, one of these tubes is connected to the position at which the measurement is to be made, while the other tube is left open to the atmosphere. When the instrument is required for use as a differential indicator, the two tubes are connected to the respective pressures or vacua being measured. The movements of the diaphragm, corresponding to the variations in the pressures to which it is exposed, are communicated to the pointer, the position of which on the scale indicates the pressure or draught.

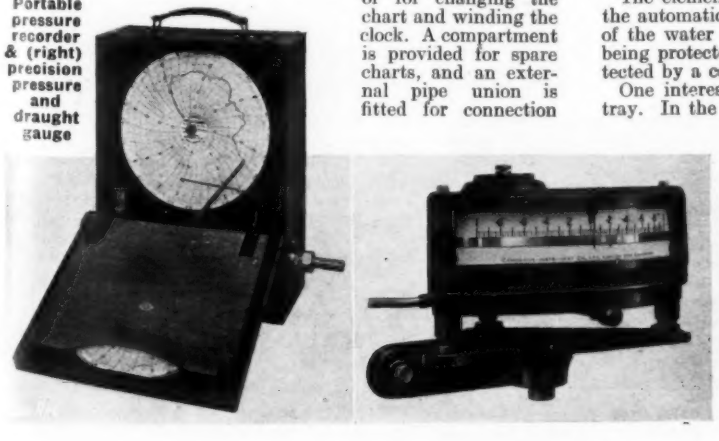
The instrument is fitted with an edgewise scale, and is mounted on a bracket arranged for fixing to a wall or other vertical support. The pointer can be accurately set by a zero adjustment.

For making occasional tests of pressures or vacua at different points in a works and obtaining permanent records, a portable pressure recorder is available.

This instrument comprises the mechanism of a standard Cambridge pressure recorder of the Bourdon tube pattern mounted within a convenient wood carrying case. By opening a door access is given to the chart for viewing the record or for changing the chart and winding the clock. A compartment is provided for spare charts, and an external pipe union is fitted for connection to the pressure or vacuum to be tested; this can, if desired, be replaced by a simple pipe connection with a tap.

An illuminated dial gauge is provided for draught or pressure indicators in positions where the lighting is poor, or where they are not easily accessible for taking close readings. The draught or pressure can be read from a considerable distance, and the ease of reading is increased if the lighting in the vicinity of the instrument is subdued.

The dial of the indicator is 13 in. in diameter and is translucent, being illuminated from behind by an electric lamp. The complete instrument is contained in a case designed for wall mounting; a model suitable for flush mounting can also be supplied.



Portable pressure recorder & (right) precision pressure and draught gauge

### An Electric Steriliser

The WHITE ELECTRICAL INSTRUMENT CO., LTD., 90, Rosoman Street, E.C.1, has just produced the "Rosoman" steriliser, which is claimed to be the first all-British model which has been made without heat regulating switches, plungers, or regulating arms.

There are two 400-W elements, which are automatically switched out of circuit when the steriliser becomes over-heated by using a bi-metal strip worked in conjunction with two mercury switches, one being set in advance of the other. By this method the temperature may be quickly brought up to boiling point, when one element is automatically switched off, the temperature being maintained at boiling point by a single element.

The White electrical steriliser

The elements are clamped on to the cast-iron base carrying the automatic switches: this in turn is screwed on to the base of the water compartment of the steriliser, the elements thus being protected from damage. The mercury switches are protected by a cover screwed from underneath the cast-iron base.

One interesting point about this steriliser is the removable tray. In the majority of cases the tray is fixed to the lid, but on this model the tray may be rested just clear of the water, actually submerged or taken completely away. There are several models, the trade prices varying from £5 12s. to £10 12s. 6d.

### A Neon Switch-light

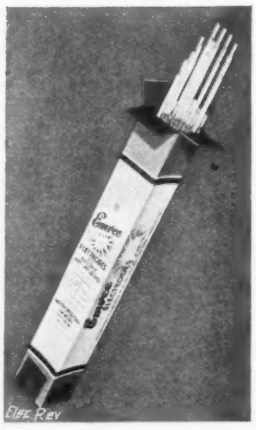
The PATENT SWITCH AND FUSE INDICATOR CO., LTD., Newall Works, Bradford, is about to manufacture a switchplate embodying a small neon light which glows when the main lamp is not switched on. The switch dolly can thus be easily located in darkness, and the wallpaper around consequently remains cleaner. The "Everlight" switchplate is made for both sunk and raised switches, but can be supplied for a.c. only. The single-hole plates cost 2s. 6d.

the larger multiple plates costing up to 18s. 9d. The plates can be easily fitted to any standard switch.

## Welding Electrodes

Few manufacturers utilise arc welding in all its different forms to a greater extent than the METROPOLITAN - VICKERS ELECTRICAL CO., LTD., does and it has designed special types of welding equipments, with or without automatic feed, for this purpose.

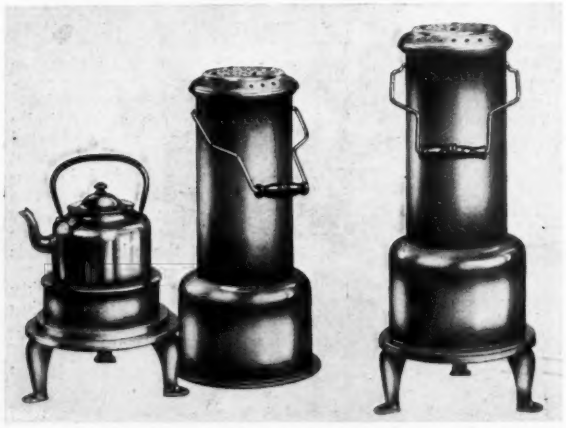
The company's research department has now developed a special general purpose electrode known as "Emvee Type R." This electrode has been found to have marked advantages over previous models, not the least of which is that the covering, which is an efficient flux, is so applied by a special process that the electrode can be bent to practically any extent without cracking or breaking away. The flux forms an active slag that cleans the surfaces of the parent plates and protects the molten weld metal from atmospheric deterioration. The average tensile strength of a weld made with this electrode is given as 70,000 lb. per sq. in.



A packet of "Emvee 'R'" electrodes

## The "Vectus" Heater

The "Vectus" 1-kW electric heater is one of the new models put on the market this year by the CREDENDA CONDUITS CO., LTD., Oldbury, Birmingham. It is constructed on unorthodox lines, employing the convection principle. The top is easily removable, leaving a boiling ring. The dimensions are: Height 24 in., and the diameter 14½ in. The weight is 14½ lb., and the appliance is priced at 32s. 6d.



The "Vectus" electric heater

## New Fires

Two new electric fires are being marketed by MESSRS. BEST & LLOYD, LTD., 40, Great Marlborough Street, London, W. Model No. 30677, priced at £6 8s., has a loading of 2 kW with two bars is 21¼ in. high, and 16 in. wide, and has a projection of 9 in. It is wired with the switch at the back and has a rippled glass front. The finish is in stippled iron and polished aluminium. The other model, No. 30433, is a three bar, 3 kW model, with two switches. It is 11¼ in. high and 20½ in. wide, and is finished in polished iron and aluminium with sprayed parts. The price is £6 3s. 6d.

The Best & Lloyd Nos. 30677 and 30433 fires

## Oil-heating Equipment

Complete box-type oil-heating equipments have been developed by MESSRS. A. REYROLLE & CO., LTD., Hebburn-on-Tyne. Each has a number of immersion heaters flange connected to a wall of an inner metal heater-tank through which the oil is circulated.

Inlet, outlet and drain connections are provided and the tank is enclosed in an enamelled sheet-metal container. Rotary switches each control two heaters, so that the loading can be varied considerably.

There are five models in the standard range of box heaters—3, 6, 9, 12 and 18 kW. The largest measures 21½ by 11¾ by 30¾ in. high. The immersion heaters, which are also supplied separately, each consist of a heating element built up on a central metal rod on which are threaded several special-refractory porcelain formers. High-grade, high-temperature resistance-wire spirals are laid lengthwise in the formers, and the whole is enclosed in a steel tube from which it can be readily withdrawn for inspection.

9-kW Reyrolle box oil heater

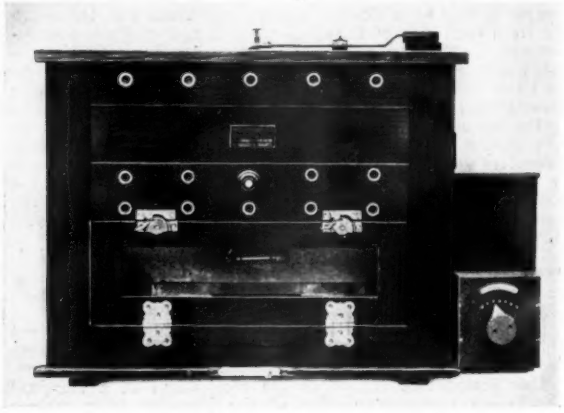
The immersers are made in three sizes, 19½, 24, and 34½ in. long, overall, for light, medium and heavy oil, respectively, with loadings varying from 1 to 3 kW. They are supplied with flanges or screw-threads for tank fixing, and with two- or three-pin inlet plugs, or with enclosed terminals, or with beaded leads for low-voltage supplies.

## An Electrically Heated Foot-warmer

An interesting piece of apparatus for warming the feet is being produced by the German firm, BENATU G.M.B.H., Kiel. It is in the form of a cushion into which the feet can be inserted and has four heats. There are two models, priced at 20.70 R.M. and 22.50 R.M.

## An Electric Incubator

The CURFEW ELECTRIC HEATERS, Curfew Poultry Farm, Gogmore, Chertsey, have designed an electric incubator which is claimed to have the lowest consumption of any on the market. It is heated by means of copper piping, the flow and return pipes running side by side thus ensuring the same temperature in all parts of the incubator. A copper plate is fixed above the heating pipes to reflect the heat down on to the eggs. The heating pipes finish in a copper boiler, to which a "Curfew" electric heater is attached.



The new Curfew electric incubator

The hatching chamber is lined with metal, which conserves the moisture, is clean and disease proof, and has a double glass inspection door. An adjustable ventilator is arranged so that the correct humidity of the hatching chamber can be maintained, and a combined thermometer and hygrometer is supplied. The electric light is controlled by a press switch fixed inside the hatching chamber and a large drying box is arranged on top of the incubator.

The 50-60-egg capacity model costs £8, while other models for 100-120, 150-170 and 200-240 eggs are priced at £10, £12, and £15 respectively.

# Supply in South Africa

## A review of the Electricity Supply Commission's activities

THE Electricity Supply Commision of South Africa produces, distributes, and supplies electricity over 11,000 sq. miles from its own undertakings and co-ordinates other undertakings. It works on a business (but non-profit making) basis and independently of political control; its opposite number in Great Britain is rather the Central Electricity Board than the Electricity Commission, which is paralleled in South Africa by the Electricity Control Board.

Unlike the C.E.B., the Electricity Supply Commission generates at its own stations, particulars of which for 1931 are given in the table below. The capital expenditure on its works amounts to £8,295,582. The works also include 659 route miles of overhead lines, 57 miles of cable, 378,051 kVA of transformers, and 64,180 kW of converters.

### Production Costs

| Undertaking. | kW installed. | kWh sold (millions). | Load factor % | Coal per kWh generated. | Thermal efficiency. % |
|---|---|---|---|---|---|
| Natal Central (Colenso) ... | 60,000 | 101 | 49.0 | 1.51 | 17.0 |
| Witbank ... ... ... | 100,000 | 603 | 75.4 | 1.73 | 16.1 |
| Cape Town (Salt River)... | 30,000* | 52 | 37.6 | 1.62 | 15.3 |
| Durban (Congella) ... | 48,000† | 104 | 52.0 | 1.38 | 17.8 |
| Sabie ... ... ... | 1,350 | 7 | 67.4 (hydro.) | | — |
| | 239,350 | 867 | | | |

* A further 20,000 kW set is on order. †Including a 12,000 kW set installed in May this year.

The cost of coal per short ton (2,000lb.) is 2s. 2d. at Witbank (11,424 B.th. per lb.), 8s. 3d. at Colenso (12,380), 14s. 2d. at Congella (12,660), and 23s. 4d. at Salt River (13,030). Omitting Witbank, where no transport is involved, railage and sidings charges represent about 83 per cent. of the cost of coal.

The overall cost in pence per kWh sold from the different stations was: Witbank, 0.126; Congella, 0.394; Sabie, 0.504; Colenso, 0.749; and Salt River, 0.993, giving an average figure of 0.286 in 1931 compared with 0.270 in 1930 and 0.298 in 1929. The production costs for 1931 (£1,032,000) were made up as follows: generation, 0.094 per kWh; distribution, 0.011; general, 0.025; interest and redemption, 0.130; and reserve, 0.026.

The kWh sold (867 million) was less than in 1930 by 22½ million, but exceeded the 1929 figure by 70 million. The reduction was due to decreases of 17¼ million kW in the supply to the Natal main line and 15¼ million kW in the output of Witbank, which were only partly offset by increases of 11 million kWh used in other directions.

### Prices to Consumers

Revenue from the sales of electricity, etc., amounted in 1931 to £1,029,915, which, after setting aside £93,687 to reserve and adding £10,005 brought forward from the previous year, left a surplus of £7,696. The average price per kWh sold was 0.281d.

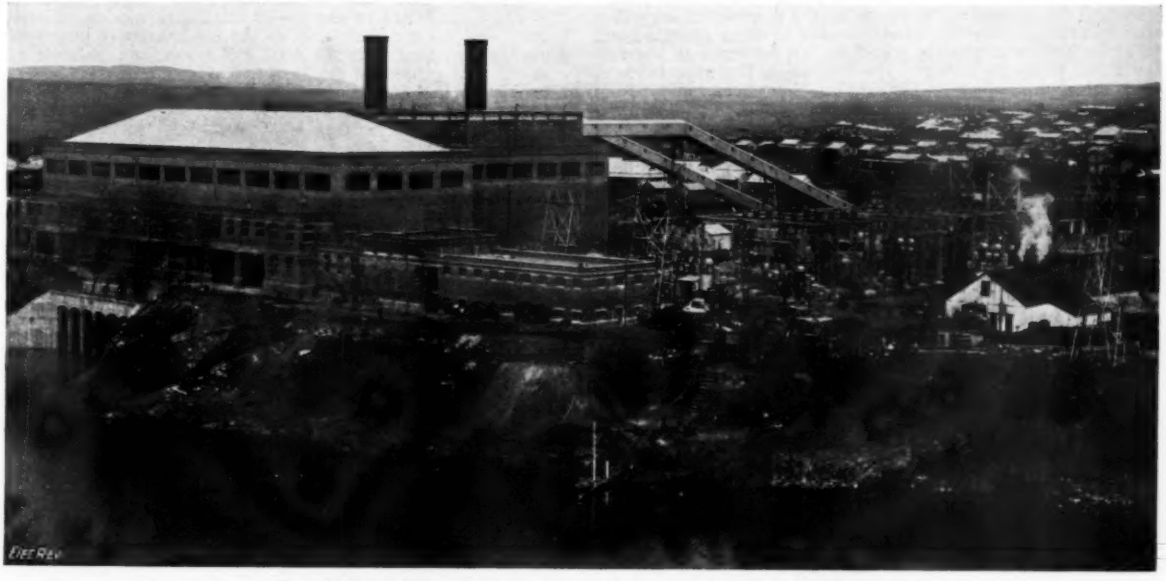
The kWh sold in millions (and average prices charged) were: traction, 113.9 (0.813d.); bulk, 690.1 (0.17d.); industrial and mining, 61.78 (0.48d.); domestic and lighting, 1.35 (3.23d.). There were two consumers for traction, 14 for bulk supplies, 99 for industrial and mining, and 1,840 for domestic and lighting. The total (1,955) represented an increase of 297 during 1931. Some 600,000 kWh was used per industrial consumer, and 732 kWh per domestic and lighting consumer. Traction supplies were converted to d.c., the cost of such conversion being about 25 per cent. of the total cost per kWh for the class. Supply was begun last February to an extension southwards of the Natal railway electrification scheme from a new 33-kV, 4,000-kW sub-station at Thornybush.

The low price for bulk supplies was due to the predominating influence of the Victoria Falls and Transvaal Power Co., Ltd., and Durban Corporation, which take supplies from Witbank and Congella, respectively, at relatively high load factors and involving no transmission costs.

Bulk supplies are also given to seventeen other local authorities: viz., at the Cape, Paarl, Stellenbosch, Malmesbury, Belleville, Goodwood, Parow, Durbanville, and Knils River; in the Transvaal, Witbank and Middelburg; in Natal, Pietermaritzburg, Mooi River, Estcourt, Colenso, Ladysmith, Glencoe, and Newcastle.

A number of other local authorities take supplies indirectly from the Commission, and at Cape Town the City Council's undertaking is interconnected with that of the Commission. Standard tariffs for three-phase energy are applicable to consumers whose m.d. is not less than 25 kVA. For the Natal Central and Witbank undertakings the tariff is (a) £25 per annum plus (b) 8s. 4d. per kVA per month. In Natal, the running charge (c) is 0.3d. per kWh for first million kWh per annum, 0.2 for the next two million, and 0.15 for the rest; in Witbank (c) is 0.045d. per kWh.

The Cape Town undertaking has a charge of (a) 13s. 7d. per month per kVA for the first 250 kVA, 12s. 3d. for the next 250 kVA, and 8s. 4d. for each additional kVA plus (b) 0.5d. per kWh for the first 100,000 kWh per month, 0.4 for the next 200,000 kWh, and 0.3 for the rest. For Durban undertaking the charge is £4 4s. per kW per annum and 0.175d. per kWh. In Sabie the total production costs are apportioned between consumers in proportion to the number of kWh supplied month by month; the average cost in 1931 was 0.505d. per kWh.



**The 60,000-kW Colenso power station of the Natal Central Undertaking**

The Commission employs a staff of 664 men, 390 of whom are Europeans. This is exclusive of the Witbank station which is managed by the Victoria Falls Co. Loan capital stands at £8 million. The reserve fund was increased in 1931 to £344,268 from £247,701. Capital expended in 1931 amounted to £217,079.

### Total Output in South Africa

There are 471 local authorities in the Union and in South-West Africa, 195 of which have electricity supply schemes. The report includes an extract from the 1929-30 Industrial Census, which gives statistics relating to the Union of South Africa. KWh generated amounted to 2,454 million (311 million by local authorities and 2,143 by others), and kWh sold to 183,279 consumers to 2,109 million; kWh sold to 166,076 domestic consumers was 142 million, or 854 per head.

The installed capacity of 214 stations was 700,796 kW (four over 50,000 kW and 165 below 1,000 kW). The plant consisted of 327 a.c. and 286 d.c. sets, which consumed 2,950,000 short tons of coal valued at £1,229,000 and other fuel at £67,000. Nine undertakings achieved a coal consumption of under 2lb. per kWh generated; fifty-five required 8lb. and over.

The route mileage of mains was 4,834 overhead and 2,928 underground, of which d.c. systems accounted for 892 and 536 respectively. Transformers installed had a capacity of 1,530,743 kVA.

The total number of persons employed in electricity supply was 8,974, who received £1,322,283 in salaries and wages.

We are indebted to the South African Railways for the accompanying illustration.

# New Books

**The Calculation of Heat Transmission.** By DR. MARGARET FISHENDEN and O. A. SAUNDERS. Pp. 280; illus. London: H.M. Stationery Office. Price 10s.

The Department of Scientific and Industrial Research has just issued a book of wide interest, particularly to engineers, technologists, and students of applied science generally.

The authors have brought together in accessible form the results of the various experimental investigations, interpreting and comparing them, so far as was feasible, in the light of the fundamental principles of radiation, conduction and convection. An attempt has been made to give a comprehensive but simple account of the available information, and to arrange it suitably for practical use. Radiation, conduction, and convection are considered separately, and in a final chapter a number of selected examples, carefully chosen to cover important practical problems, show how the formulæ and coefficients deduced from the experimental data can be applied.

Complicated theoretical considerations and highly specialised technical applications have been avoided as much as possible, but it was thought essential to include a brief account of the fundamental physics of heat transmission.

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**Theory of Dielectrics.** By ING.-DR. A. SCHWAIGER. Translated by Royal W. Sorensen. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Pp. xii+473; figs. 448. Price 40s.

This book is the English translation of the second edition of a volume first published in 1919 under the title of "Elektrische Festigkeitslehre," carried out by Prof. Sorensen, of the California Institute of Technology.

The author gives a clear exposition of the fundamental laws of electrostatics and shows how these form the basis for electric strength calculations. By means of the dielectric theory it is possible to determine the stress tending to cause puncture and arc-over and consequently a method for determining the arc-over and puncture voltage. He emphasises the importance of field strength in electrostatics and calculates the gradient from the dimensions of the arrangements of and the potential between the electrodes.

The calculation of dielectric strength of an insulating material is of much practical importance, as it is the voltage gradient beyond which the insulation cannot hold back the voltage; when this voltage gradient is exceeded disruption occurs, the insulation ceases to insulate and becomes a conductor. Of late years numerous connections have been observed between dielectric and other properties, and Debye's theory of molecular polarity is receiving increasing experimental support. Debye has applied to dielectrics a treatment analogous to that used by Langevin discussing paramagnetism.

Dielectric absorption is responsible for the greater part of the losses incurred in dielectric materials under the action of alternating electric stress. Ordinarily, the dielectric losses are small, but in high-voltage cables where the stresses are very high, they may be large enough to cause a dangerous rise in temperature, which, in turn, will decrease the insulation resistance and further increase the loss.

This volume is of service not only to students, but also to those engaged in industry, a feature being the comprehensive bibliography. The selection of references has been judiciously carried out and a recommendation made that the subject matter of these references should be absorbed into the general scheme of teaching the subject at colleges. The text is highly commendable and a powerful aid in the development of fundamental thinking. As we are acquainted with the original German edition, we can appreciate the translator's difficulty in presenting the subject in a readable form and yet with such detail as to anticipate probable sources of errors on the part of the beginner; this problem has been most happily solved by Dr. Sorensen.

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**Will's Electricity Supply.** By EDGAR MACASSEY. Sixth edition, with an introduction revised by H. F. Bidder. Pp. lv.+689×54. London: Butterworth & Co. (Publishers), Ltd. Price 42s.

The new edition of the indispensable "Will's" includes the text of the 1926 Act with explanatory comments in addition to most of the matter contained in the fifth edition published in 1924. Appropriate references to relevant decisions reported since that date are also incorporated.

Otherwise, the main difference between this and the previous editions is the omission of Part II, which dealt with electric traction. In substitution, the text of the more important of the recent private Acts relating to electricity supply in London is given in full.

* * *

## Shorter Notices

A nineteen-page booklet containing a considerable amount of tabulated data which has been compiled by Denki Kyokai, the Electrical Association of Japan, shows the remarkable development of the electricity supply industry up to 1930. The copy sent us by Mitsui and Co., Ltd., 31, Lime Street, London, E.C.3, contains striking figures relative to the amount of electricity generated thermally and by water power, and the consumptions for lighting, power, traction, and electro-chemical purposes, together with interesting comments on tendencies and future prospects.

"Electrical Resistance Alloys." Issued by Messrs. Henry Wiggin and Co., Ltd., Thames House, S.W.1, free of charge to those concerned in the use of electric resistance materials. Such subjects are dealt with as the mechanism of heat resistance, calculating data for heat apparatus, and physical and mechanical properties and various resistance materials. The booklet is in loose-leaf form and other sections will be published from time to time.

"Memorandum on Accident Prevention, including Reproductions of Typical Charts and Posters." Pp. 22+viii; figs. 18. London: Industrial Welfare Society.—The fundamental principles of organised accident prevention campaigns for industrial establishments are outlined, together with systems of record keeping which will enable the economic value of such schemes to be fully appreciated.

"Welding and Cutting on Railways and Tramways." London: The Institution of Welding Engineers. Price: 3s. 6d. —These are three prize papers in the 1931 competition promoted by the Institution. Electric welding is dealt with in the second paper and welding repairs on electric trains are treated in the third paper.

"Modern Methods of Case-hardening." Pp. 45; figs. 27. London: Imperial Chemical Industries, Ltd. This booklet explains the Cassel Cyanide Co.'s process. Instead of using a packing compound in the solid state as the hardening agent, the part to be treated is immersed in a molten cyanide bath.

"Outline Notes on Telephone Transmission Theory," by W. T. Palmer, with a foreword by W. Cruikshank. Pp. 168; figs. 70. London: The Electrical Review. Price 5s.

"Admiralty Handbook of Wireless Telegraphy, 1931." Pp. 1012; illus. London: H.M. Stationery Office. Price 7s. 6d.

"Distribution," Vol. IV., complete and bound in one volume containing the monthly issue from June, 1931, to May, 1932. London: W. T. Henley's Telegraph Works Co., Ltd.

"Die Raumänderungen der Baustoffe," by Heinrich Luftschitz. Pp. 50; figs. 71. Berlin: Wilhelm Ernst & Sohn. Price: Rm. 6.50.

# Indian Electrical Notes.

FROM OUR OWN CORRESPONDENT

THE merger of the Eastern Telegraph Co. with the Indian Radio Telegraph Co., as arranged previously by agreement, took place on July 1st, and there was an exchange of congratulatory messages between the chairmen of the Imperial and International Communications, Ltd., and the Indian Radio and Cable Communications, Ltd. (the title by which the new merger will be known in future). Both expressed the hope that now that the two systems of communication were brought under one management and control, the trade of India and of the rest of the Empire would receive a great impetus and that the future of the company would justify the most sanguine expectations.

### Electricity in Travancore State

There is every prospect that the Government of Travancore State shortly will proceed with a hydro-electric power scheme at the Pallivasal falls. The Standing Finance Committee has already made a provision of Rs. 6 lakhs for the prosecution of this scheme. The Pallivasal falls are on the Mudrapuza river, a tributary of the Periyar river. The stream runs through a gorge about a mile and a half above the falls, and it may be possible to construct a dam about 50 to 60 ft. high at the head of this gorge; the available fall from the dam would be about 800 ft. The rainfall of the place is about 400 in. per annum, the catchment being probably 50 sq. miles. There is, therefore, great scope for development.

### The Tata Power Companies

Tata Sons, Ltd., agents of the Andhra Valley Power Supply Co., Ltd., have completed a large financial deal with the Central Bank of India in respect of the company's debenture issue of Rs. 125 lakhs, whereby the Central Bank has taken up the entire issue and arrangements are now being made by them to offer a part of it to the public in the near future. The debentures are payable within twelve years, will bear interest at 6 per cent. per annum, and will be issued at Rs. 97. These debentures are being issued to pay off the existing sterling and rupee debentures, which fall due for repayment on April 1st, 1933.

### Pykara Progress

The Pykara scheme is now well on the way to completion, and the whole of the work will be finished within the original estimates of Rs. 120 lakhs. The erection of machinery is now taking place, and in the power house three impulse turbines of 8,730 h.p., operating under a gross static head of 3,074 ft. and running at 600 r.p.m., are being installed. Three turbines will be coupled to three 7,810-kVA three-phase, 50-cycle, 11,000-V alternators running at 600 r.p.m. with direct coupled exciters. Three 7,810-kVA, three-phase, 50-cycle, 11,000/66,000-V oil immersed, forced oil-cooled, outdoor-type transformers are also under erection. The total weight of these huge transformers with oil is 76,000 lb., the tank alone weighing 14,000 lb. and the transformer 36,000 lb.

# Australian Electrical Imports

THE following figures showing the values of the imports of electrical goods into Australia in the fiscal year 1930-31 have been taken from the recently-issued official trade returns. For the purposes of comparison, notes of increases or decreases as compared with the previous year are given.

Australia carries on a small export trade in electrical goods of her own manufacture. The total value for 1930-31 was £55,000 against £60,000 in 1929-30.

| | 1930-31. £ | Inc. or Dec. £ |
|---|---|---|
| *Motors under one h.p. when not integral parts of machines—* | | |
| Total | 67,000 | — 13,000 |
| From United Kingdom | 12,200 | — 3,100 |
| „ United States | 45,000 | — 13,000 |
| *Dry cells—* | | |
| Total | 3,900 | —111,100 |
| From United Kingdom | 2,500 | — 17,500 |
| „ United States | 1,200 | — 75,800 |
| *Nickel alkaline batteries—* | | |
| Total | 100 | — 200 |
| *Storage batteries with plates larger than 7¾in. × 10in.—* | | |
| Total | 2,800 | — 500 |
| From United Kingdom | 2,500 | — 500 |
| *Other storage batteries—* | | |
| Total | 31,000 | —150,000 |
| From United Kingdom | 25,000 | — 74,000 |
| „ United States | 5,500 | — 70,500 |
| *Other batteries—* | | |
| Total | 3,900 | — 31,100 |
| From United Kingdom | 1,500 | — 5,800 |
| „ United States | 2,400 | — 13,600 |
| *Cable and wire, covered with cotton—* | | |
| Total | 14,400 | — 5,600 |
| From United Kingdom | 14,200 | — 5,800 |
| „ United States | 100 | — 100 |
| *Cable, telegraph and telephone, paper insulated, lead covered—* | | |
| Total | 1,700 | — 19,300 |
| From United Kingdom | 1,700 | — 14,300 |
| *Other telegraph and telephone cable—* | | |
| Total | 22,500 | — 42,500 |
| From United Kingdom | 21,700 | — 42,300 |
| *Power cable, paper insulated, lead covered—* | | |
| Total | 55,000 | —358,000 |
| From United Kingdom | 55,000 | —356,000 |
| *Other cable and wire—* | | |
| Total | 414,000 | —584,000 |
| From United Kingdom | 355,000 | —578,000 |
| „ United States | 26,000 | — 9,000 |
| *Carbon manufactures—* | | |
| Total | 32,000 | — 5,000 |
| From United Kingdom | 11,000 | — 3,000 |
| „ United States | 9,000 | — 4,000 |
| „ Germany | 4,900 | + 400 |
| *Dynamo-electric machines, a.c.—* | | |
| Total | 183,000 | —239,000 |
| From United Kingdom | 155,000 | —117,000 |
| „ Switzerland | 2,000 | — 6,000 |
| „ Germany | 1,600 | — 3,000 |
| „ United States | 19,000 | —102,000 |

| | 1930-31. £ | Inc. or Dec. £ |
|---|---|---|
| *Dynamo-electric machines, d.c.—* | | |
| Total | 110,000 | —107,000 |
| From United Kingdom | 85,000 | — 70,000 |
| „ Germany | 3,500 | — 10,500 |
| „ Switzerland | 5,000 | + 3,000 |
| „ United States | 14,000 | — 30,000 |
| *Dynamo-electric machines, universal—* | | |
| Total | 860 | — 18,140 |
| From United Kingdom | 650 | — 17,350 |
| *Fans, electric—* | | |
| Total | 17,000 | — 39,000 |
| From United Kingdom | 2,700 | — 7,300 |
| „ Italy | 9,600 | — 7,400 |
| „ United States | 4,200 | — 17,800 |
| *Small self-contained lighting sets—* | | |
| Total | 1,600 | — 10,200 |
| From United Kingdom | 400 | — 5,300 |
| „ United States | 1,200 | — 4,500 |
| *Switches, fuses and lightning arrestors—* | | |
| Total | 150,000 | —210,000 |
| From United Kingdom | 113,000 | —151,000 |
| „ United States | 25,000 | — 55,000 |
| „ Germany | 5,500 | — 500 |
| *Heating and cooking appliances—* | | |
| Total | 27,000 | — 84,000 |
| From United Kingdom | 3,500 | — 35,500 |
| „ Canada | 8,500 | — 26,500 |
| „ United States | 11,700 | — 15,300 |
| *Lamps, filament—* | | |
| Total | 522,000 | —106,000 |
| From United Kingdom | 241,000 | — 98,000 |
| „ Hungary | 3,900 | + 500 |
| „ Austria | 19,000 | + 400 |
| „ Holland | 212,000 | + 14,000 |
| „ United States | 17,000 | — 9,000 |
| *Measuring and recording instruments—* | | |
| Total | 62,000 | — 51,000 |
| From United Kingdom | 31,000 | — 32,000 |
| „ Switzerland | 5,500 | — 4,500 |
| „ United States | 19,500 | — 10,500 |
| „ Canada | 1,600 | — 400 |
| *Regulating and controlling apparatus—* | | |
| Total | 181,000 | —185,000 |
| From United Kingdom | 109,000 | — 89,000 |
| „ United States | 60,000 | — 87,000 |
| „ Switzerland | 3,300 | — 2,900 |
| „ Canada | 1,100 | + 100 |
| *Static transformers and induction coils—* | | |
| Total | 20,300 | —123,700 |
| From United Kingdom | 15,700 | — 83,300 |
| „ United States | 2,700 | — 21,300 |

| | 1930-31. £ | Inc. or Dec. £ |
|---|---|---|
| *Arc lamps, except for kinematographs—* | | |
| Total | 500 | — |
| *Telegraph instruments and appliances—* | | |
| Total | 5,700 | — 1,300 |
| From United Kingdom | 5,300 | + 1,000 |
| *Telephones—* | | |
| Total | 29,500 | — 24,500 |
| From United Kingdom | 22,400 | — 23,600 |
| „ Sweden | 200 | — 500 |
| „ United States | 6,000 | + 1,000 |
| *Telephone switchboards and appliances—* | | |
| Total | 144,000 | —157,000 |
| From United Kingdom | 130,000 | —122,000 |
| „ Belgium | 2,500 | — 2,700 |
| „ Germany | 2,500 | — 2,100 |
| „ United States | 7,300 | — 30,700 |
| *Vacuum tubes, electrical—* | | |
| Total | 82,000 | + 40,000 |
| From United Kingdom | 9,500 | — 1,500 |
| „ Holland | 18,500 | + 13,100 |
| „ United States | 54,000 | + 29,000 |
| *Valves for wireless telegraphy or telephony—* | | |
| Total | 210,000 | + 6,000 |
| From United Kingdom | 70,000 | — |
| „ Holland | 65,000 | + 8,000 |
| „ United States | 75,000 | — |
| *Wireless receiving sets, accessories and parts—* | | |
| Total | 138,000 | —265,000 |
| From United Kingdom | 30,000 | — 40,000 |
| „ Germany | 14,000 | — 14,000 |
| „ Holland | 22,000 | — 50,000 |
| „ United States | 72,000 | —156,000 |
| *Electrical appliances, n.e.s.—* | | |
| Total | 261,000 | —337,000 |
| From United Kingdom | 108,000 | —156,000 |
| „ Canada | 1,000 | — 2,000 |
| „ Belgium | 1,400 | — 12,600 |
| „ Germany | 45,000 | — 5,000 |
| „ United States | 87,000 | —120,000 |
| *Electrical ware of earthenware, including insulators—* | | |
| Total | 26,000 | — 5,000 |
| From United Kingdom | 4,000 | — 2,000 |
| „ Canada | 5,000 | + 1,000 |
| „ Japan | 1,000 | — 1,300 |
| „ United States | 11,000 | — 5,000 |
| *Electrical insulating paper and boards—* | | |
| Total | 13,600 | — 13,000 |
| From United Kingdom | 6,500 | — 5,800 |
| „ United States | 3,300 | — 4,300 |

# Ceylon's Electrical Imports

THE following table shows the value of Ceylon's imports (including Government stores) during last year. The figures have been taken from the official foreign trade returns. Notes of increases or decreases compared with 1930 have been added for purpose of comparison. A rupee equals approximately 1s. 6d.

| | 1931. Rs. | Inc. or dec. Rs. |
|---|---|---|
| *Insulated wires and cables—* | | |
| Total | 423,000 | — 457,000 |
| From United Kingdom | 388,000 | — 446,000 |
| „ Germany | 16,800 | — 7,000 |
| *Control and switchgear—* | | |
| Total* | 104,000 | — 15,000 |
| *Radio instruments and apparatus—* | | |
| Total | 82,000 | † |
| From United Kingdom | 35,000 | — |
| „ Germany | 24,000 | — |
| „ Holland | 13,000 | — |
| *Other telegraph and telephone instruments—* | | |
| Total | 148,000 | † |
| From United Kingdom | 144,000 | — |
| „ Sweden | 1,500 | — |

| | 1931. Rs. | Inc. or dec. Rs. |
|---|---|---|
| *Lighting accessories, fittings, and switches—* | | |
| Total | 538,000 | — 142,000 |
| From United Kingdom | 201,000 | — 174,000 |
| „ Germany | 84,000 | + 41,000 |
| „ Holland | 39,000 | — 12,000 |
| „ Japan | 11,000 | + 1,300 |
| „ United States | 178,000 | + 5,000 |
| *Electrical goods and apparatus not elsewhere specified—* | | |
| Total | 267,000 | — 581,000 |
| From United Kingdom | 242,000 | — 524,000 |
| „ Germany | 11,000 | — 27,000 |
| „ Holland | 2,200 | — 4,300 |
| „ United States | 7,300 | — 11,500 |
| *Transformers and converters—* | | |
| Total | 27,400 | — 119,600 |
| From United Kingdom | 27,000 | — 120,000 |
| „ United States | 400 | — 400 |

| | 1931. Rs. | Inc. or dec. Rs. |
|---|---|---|
| *Generators, dynamos and alternators—* | | |
| Total | 108,000 | — 106,000 |
| From United Kingdom | 105,000 | — 85,000 |
| „ United States | 1,400 | — 500 |
| *Motors—* | | |
| Total | 100,000 | + 1,000 |
| From United Kingdom | 77,400 | — 5,400 |
| „ United States | 22,000 | — 1,000 |
| *Electrical machinery, not elsewhere specified—* | | |
| Total | 269,000 | — 442,000 |
| From United Kingdom | 196,000 | — 328,000 |
| „ Germany | 11,500 | — 50,500 |
| „ Italy | 11,100 | + 700 |
| „ United States | 48,700 | — 54,300 |

* Nearly all from the United Kingdom.

† In 1930 radio apparatus was not separately recorded; the total imports of all telegraph and telephone apparatus was then Rs. 394,000, of which the United Kingdom supplied Rs. 346,000.

# French Foreign Electrical Trade

FRENCH imports and exports of electrical machinery apparatus and goods during the past two years are shown in the appended tables. The values are given in thousands of francs. It will be seen that, as a result of the world trade depression, there was a marked decrease in both the imports and the exports, amounting in both cases to about 14 per cent.

| Imports | 1930. 1,000 fr. | 1931. 1,000 fr. | Inc. or Dec. 1,000 fr. |
|---|---|---|---|
| Dynamo-electric machines and transformers | 205,685 | 165,877 | — 39,808 |
| Teleg., teleph., and other electrical apparatus | 306,586 | 299,795 | — 6,791 |
| Dynamo and motor parts | 2,332 | 273 | — 2,059 |
| Incandescent lamps | 110,443 | 92,332 | — 18,111 |
| Arc lamps and parts | 423 | 680 | + 257 |
| Carbons for electrical and industrial purposes | 13,409 | 11,796 | — 1,613 |
| Electric wires and cables | 43,154 | 21,412 | — 21,742 |
| Parts of electrical apparatus | 44,790 | 25,916 | — 18,874 |
| Magnets, other than electro-magnets | 2,348 | 2,347 | — 1 |
| Accumulators and parts | 9,309 | 6,736 | — 2,573 |
| Dry batteries and condensers | 6,696 | 8,414 | + 1,718 |
| Porcelain and other insulators | 7,214 | 7,572 | + 358 |
| Total | 752,389 | 643,150 | — 109,239 |

| Exports | 1930. 1,000 fr. | 1931. 1,000 fr. | Inc. or Dec. 1,000 fr. |
|---|---|---|---|
| Dynamo-electric machines and transformers | 83,159 | 92,946 | + 9,787 |
| Teleg., teleph., and other electrical apparatus | 184,812 | 158,429 | — 26,383 |
| Dynamo and motor parts | 203 | 76 | — 127 |
| Incandescent lamps | 35,269 | 27,458 | — 7,811 |
| Arc lamps and parts | 1,260 | 2,077 | + 817 |
| Carbons for electric and industrial purposes | 29,354 | 21,191 | — 8,163 |
| Electric wires and cables | 69,938 | 51,744 | — 18,194 |
| Parts of electric apparatus | 49,812 | 41,888 | — 7,924 |
| Magnets, other than electromagnets | 229 | 178 | — 51 |
| Accumulators and parts | 36,595 | 27,062 | — 9,533 |
| Dry batteries and condensers | 5,171 | 4,382 | — 789 |
| Porcelain and other insulators | 24,661 | 20,253 | — 4,408 |
| Total | 520,463 | 447,684 | 72,779 |

# Standard Costs. By A. W. Willsmore, F.R.Econ.S.

## Ensuring effective industrial control

A RELIABLE and comprehensive costing system as a factor in industrial success, particularly in times of business depression, when increased competition involves taking orders at a very low rate of profit, is of great importance. There is a growing conviction among business men that the old order cost system is both antiquated and inadequate.

Information on costs serves a double purpose. On the one hand, costs are required to serve as a basis for the determination of selling prices; on the other, they must be used as a check on efficiency. It is contended that from both these aspects the order cost system gives unsatisfactory results; the standard costs system is suggested as an economical alternative particularly suited to needs of the usual type of company encountered in the electrical industry.

The fundamental differences between the order cost system and standard costs may be indicated. In the order cost system the actual costs incurred on particular orders are calculated after manufacture is completed. Records are thus obtained which relate to conditions ruling in the past. Results are often shown up only after it is too late to remedy inefficiencies, and figures which are a reflection of past conditions are not necessarily a true indication of the future. In the standard cost system the record of historic costs is replaced by a forecast of future costs, and an advance indication is given of the existence of uneconomic conditions. Coupled with the standards, actual costs are calculated in the usual way to show where any variation has occurred and to indicate the reasons for it.

The main elements of costs are materials, labour, and overhead expenses. The idea of the standard cost system is to establish standard times and labour rates for individual operations and standards for material costs. Coupled with a logical system for the distribution of overhead expense, these enable standard costs to be established based on reasonable expectations. Any failure to meet these figures either indicates inefficiency calling for corrective action or points to a need for the revision of the standards. Standard costs thus enable a continual check to be kept on efficiency in the factory, and being based on anticipated future business they offer a reliable basis for the determination of selling prices.

### Time and Motion Study

Standard costs represent a development of the principle of control by standards in the shop which originated with W. A. Taylor and his associates. Their attitude towards the question of control by standards embraced the time study system for the establishment of standard times for operative labour. The principle was to study efficient workers with a view to deciding the minimum time in which individual operations could be performed. After making necessary allowances, this offered the basis for a standard time per operation serving as the foundation for piece-work rates and offering a check on the efficiency of the individual worker. The next step was to carry the principle forward and study the individual motions involved by each operation, with a view to collecting the optimum combination involving the minimum operation time. A standard method of performance was thus associated with a standard time for the operation.

Although the institution of this time and motion study system has been challenged on the grounds that it ignored many important psychological elements, the basic idea formed the foundation of modern scientific management. The modern factory manager employs the same principle of time and motion study, but he modifies his technique in line with the known limitations of the human mechanism—the introduction of rest periods to counteract fatigue is a case in point. As a result, the full benefits of the system are realised in the establishment of the best and quickest possible way of performance, coupled with a fair and logical basis for remuneration by results, without the disadvantages encountered by the earlier exponents of the system.

Having established stable labour costs through payment on the basis of standard times, attention was next directed towards the standardisation of the other elements of factory cost. Standard layouts and material quantities are now a familiar feature of shop operation, and many concerns are taking the final step in this progress towards completely standard costs. This implies the establishment of a logical system for the distribution of overhead expense so that the burden borne by each operation is in fair and fixed proportion to the extent of its utilisation of the services implied by overhead expense.

### Essential Prior Conditions

An efficient standard cost system implies the existence of these conditions :—

1. Where the company's employment policy has been firmly established on the lines of definite rates of pay for particular grades of work, and standard time allowances (based on time and motion studies) for particular shop operations.
2. Where the production system has been overhauled in the direction of standardising material quantities, and where the purchasing policy is aimed at the maintenance of uniform cost and quality of materials.
3. Where a logical system has been established for the distribution of overhead expense on the basis of the machine hour rate system or by some similar sound system.

Where such conditions have been reached, industrial management has the advantages implied by a comprehensive advance knowledge of standard costs, and can take any necessary corrective action to remedy inefficiencies before their effects are felt on the profit and loss balance. A comparison of such predetermined costs against competitive figures readily leads to the investigation of the causes of any discrepancies. These may be found to arise from the existence of a relatively expensive machine set up for the particular operation or from manufacture in uneconomic quantities, from poor purchasing, from uneconomic wage rates, from the employment of too high a grade of labour for the particular operation, or from similar circumstances.

The movement towards basing control on standards has not been confined to the production field. Management is rapidly appreciating that effective control implies the existence of some yardstick against which actual efficiency can be measured. As a result there is a strong inclination towards the development of standards to cover all phases of business activity. Comparison of actual realisation against these standards discloses inefficiencies. Business is thus provided with a measure of its efficiency, and by the nature of the standards used with an indication of the directions in which improvements could be effected.

### Financial Standards

In the field of financial control, for instance, several companies have established standards for turnover of inventories, for investment in fixed plant and properties, for gross profit margins, and for expense ratios. This particular development has been more extensive in the United States than in this country, where the relatively meagre details published by public companies offer a handicap to the determination of competitive standards for particular industries. But in spite of this difficulty, much valuable work has been done by certain individual firms in the direction of the calculation of standards based on theoretical efficiencies. The same principle has been put into practice through the adoption of the budget control, and considerable progress is also being made in the direction of expense control. Factory expense is no longer regarded as an uncontrollable element, but rather as a function of shop activity. To this end, a distinction is made between the fixed elements of expense that remain unchanged irrespective of business volume, and the items that fluctuate in accordance with a rise or fall in shop output. In this way, a flexible expense standard is established that can be adjusted to apply to any level of actual activity.

Undoubtedly, the practice of control by standards will take a prominent part in management technique in the next decade. To ensure success, however, it is essential that the standards should be developed from a clear-eyed analysis of possibilities and not from haphazard historical studies. Granted reliable standards, the system offers the obvious advantages of a continuous bird's-eye view of current efficiency.

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### Lamp Competition in Manchuria

Largely as a result of keen Japanese competition, which is entirely on a price basis, sales of American electric lamps in Manchuria have fallen off by approximately 50 per cent. in the last two years. The U.S. Department of Commerce reports that the superior quality of other makes is outweighed by the extremely low prices at which the Japanese bulbs are offered. Up till 1930, American manufacturers supplied approximately 20 per cent. of the lamps used in Manchuria, with Germany supplying 10 per cent., and Japan the remainder. Since that time Soviet Russian lamps have gained entrance to the market and the respective proportions of the supplying countries now stand: Japan, 80 per cent.; United States, 10 per cent.; Germany and Russia about 5 per cent. each. The recent drop in the exchange value of the yen has proved an additional advantage to Japanese exporters. Japanese lamps have been imported into the United States in increasing quantities. During 1931 the total value of these imports was $1,373,230, representing approximately 71,000,000 lamps. Shipments from Japan during last March were valued at $138,000, and in April $81,000. About one-third of the Japanese lamps entering Manchuria are large, the remainder being of the smaller classes for flashlight torches, decoration, and similar purposes.

# Business and Industrial Notes

**The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures**

## The Imperial Economic Conference

The conference at Ottawa between representatives of the member countries of the British Empire came to an end on Saturday last and the text of the agreements arrived at between Great Britain and the Dominions was published on Monday.

In general these agreements relate to the adjustment of tariff preferences with a view to increasing inter-Imperial trade, and broadly provide that in return for the facilitating of the entry of Dominion foodstuffs and raw materials into this country, the Dominions will endeavour to increase their imports of goods manufactured in Great Britain.

The definitely "electrical" parts of the agreements are not of outstanding importance, although no doubt electrical products will share in any general improvement which may be brought about. In the agreement with South Africa, Great Britain undertakes to impose a duty of 2d. per lb. on imported foreign unwrought copper in place of any existing duty. It is provided that Empire producers of copper shall continue to offer the metal on first sale in the United Kingdom at a price not exceeding the world price. In return South Africa is to increase preferences on certain selected articles, mainly in the iron and steel and machinery classes. The agreement with Canada provides that the existing 10 per cent. duty on certain classes of foreign imports, including asbestos, zinc and lead, shall not be reduced without the Canadian Government's consent. Canadian copper producers will also benefit by the proposed new duty on the metal.

A similar agreement is made with the Commonwealth of Australia. The latter Government undertakes to remove as soon as possible its ban on the importation of certain goods, and to remove or reduce surcharges and primage duties imposed upon imports into Australia.

Southern Rhodesia, in recognition of advantages to be given to its exports to this country, has undertaken to give a margin of preference amounting to 15 per cent. *ad valorem* on electrical primary and secondary batteries imported from Great Britain and on radio-telegraph and telephone apparatus, and a preference of 10 per cent. on electrical material (except cable and wire).

Further schedules of goods affected by the agreements are to be published later.

## B.T.-H. Transformers for India

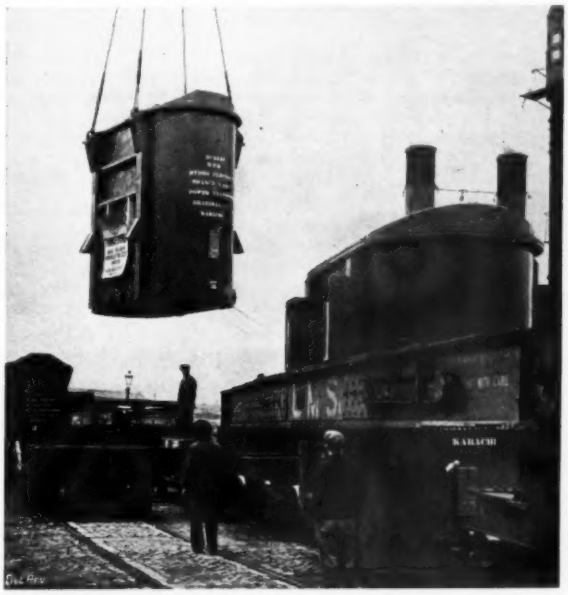
An exceptionally large shipment of transformers—part of the electrical equipment ordered from the British Thomson-Houston Co., Ltd., for the Uhl River Hydro-Electric Scheme, has just been made for the Birkenhead Docks. They vary in size from 800 to 12,000 kVA and have a total output of approximately 168,000 kVA.

A special train of thirty-two goods vehicles was employed to convey the equipment to the docks, the size of several of the transformers necessitating the use of specially constructed wagons. Our illustration shows one of the transformers being lifted from a trolley at the Birkenhead Docks, into the hold of the "City of Bagdad." This vessel is fitted with heavy lifting equipment, and on arrival at Karachi, can land even the heavy 12,000-kVA transformers.

**A West Ham electric fan display**

Other B.T.-H. electrical equipment for the Uhl River Scheme comprises switchgear and four waterwheel alternators, each rated at 12,000 kW, 11,000 V, 50 cycles, three-phase, 428 r.p.m. The switchgear includes 11,000-V metal-clad gear for the Shanan generating station, 132,000-V gear for controlling the step-up transformers and outgoing transmission lines, outdoor switchgear for seven 132,000-V step-down transformer sub-stations, 66,000-V gear for nine sub-stations, and 11,000-V metal-clad gear for each of the sub-stations.

A feature of the transformers now *en route* is that the insulation has been co-ordinated with that of the system so that the windings are definitely stronger under transient over-voltage conditions than the adjacent line. Many of the transformers have three windings, one for a circuit of 130,000 V, and tested at 300,000 V; a second for a 66,000-V circuit, and tested at 175,000 V; and a third for a circuit of 11,000 V, and tested at 31,000 V.



**A B.T.-H. transformer at the Birkenhead Docks on its way to India**

## The Floodlighting of Shell-Mex House

The tower of the new Shell-Mex building on the Embankment, London, is to be floodlighted by means of thirty projectors giving an illumination intensity of 20 foot-candles. The Edison Swan Electric Co., Ltd., will be responsible for the installation.

## A Refreshing Window Display

During the recent heat-wave, the West Ham Corporation Electricity Department staged an enterprising window display. This represented a seaside resort with models garbed in bathing costumes while in the foreground were arranged a number of electric fans, the whole display creating an impression of cool breezes.

## Lotus Radio *versus* R. Burns

In the Vacation Court on July 17th Mr. Justice Goddard had before him a motion by the Lotus Radio, Ltd., against R. Burns for an injunction to restrain the infringement of two registered designs and also for an injunction to restrain passing-off.

Counsel said that the plaintiffs were the manufacturers of cabinets and it was in respect of these they issued the writ. The urgency of the matter lay in the fact that the Radio Exhibition was about to open and plaintiffs were exhibiting, and if the defendant continued selling he might damage the company. Counsel added that his trouble was that they had served the writ on the wrong person. It had been served on Mr. R. Burns, whereas the owner was Mrs. R. Burns.

Mr. R. Burns appeared and said the shop was his mother's, Mrs. R. Burns. It formerly belonged to his father, who traded as John Burns & Co. The cabinets were purchased in the ordinary way. He was willing to put an end to the matter by promising, as he had already offered, not to sell any more of the cabinets, and to give an undertaking to surrender the remaining ones he had, if each party paid its own costs.

Ultimately his Lordship allowed the amendment of the writ and granted the injunction, defendant undertaking to deliver up the cabinets, and made no order as to costs.

## Trade Announcements

With reference to the registration of Messrs. Baxter and Caunter, Ltd.—the new company—recorded in our August 12th issue (p. 236), we are asked to state that though the description of the company's objects under the Articles of Association include the word "contractors," they do not undertake any form of electrical wiring or installation work.

Messrs. R. T. Yeates and G. J. T. Hartigan have commenced business as the British Fan & Electric Company, ventilating and electrical engineers, at 21, Mount Pleasant, Rosebery Avenue, London, E.C.1.

Pearce Bros., electrical engineers, of Bromley, Kent, have opened new showrooms and offices at 46, Widmore Road.

Lewis Thomas & Sons, Ltd., electrical engineers, of Aberystwyth, are shortly opening a showroom and inquiry office at Salon Chambers, 8, Broad Street, Newtown, Mont.

After next Monday, August 29th, the head office and works of Messrs. Bastian & Allen, Ltd., will be transferred to 12 & 14, Church Road, Hanwell, W.7 (telephone: Ealing 6733/4/5).

Crane, Ltd., have moved to 45/51, Leman Street, E.1. Their telegraphic address is unchanged, but the telephone number is now Royal 7343.

The British Aluminium Co., Ltd., is removing its London warehouse next Monday to 23-25, Pancras Road, N.W.1.

The address of Elcordon, Ltd., is now Cambridge Arterial Road, Enfield, Middlesex (telephone: Enfield 3478).

Messrs. Lord & Shand, Ltd., electrical and mechanical engineers, are shortly opening premises at 31, Westwell Street, Plymouth.

Messrs. Vincent Jackson are opening new premises at 313, Aigburth Road, Liverpool, as electrical and radio stores and showrooms, and will be glad to receive catalogues, showcards, &c., from manufacturers.

## A Permanent Trade Exhibition

A group of London business men proposes to utilise Gamage's (West End) building in Oxford Street as a permanent exhibition of British goods and as a trading centre for home and overseas buyers. The building, which is to be renamed "British Industries House," will be open to the public only on special occasions.

## Price Reductions

Messrs. Elliott Brothers (London), Ltd., announce that improved methods of manufacture have enabled them to reduce considerably the prices of their miniature type "M.R." round pattern d.c. moving-coil ammeters and voltmeters. These instruments are made in the projecting pattern with back terminals, or for flush mounting, and can be supplied with metal or black moulded bakelite cases.

## Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the August 2nd cost-of-living figure is 41 per cent. above the 1914 level. This does not involve any alteration in wages on the third pay day in September.

## The New Season's Lamp Publicity

Three important selling appeals are included in the Mazda display material for the coming season. These are (1) the "Wonderful Non-Sag Filament"; (2) The "Mazda" dancing girl with her popular slogan "Beauty enriched by light"; and (3) "Made in England from British Materials." The new "Mazda" publicity material is also exceedingly attractive and colourful. There is a window display supplied complete with a length of flexible cord, adaptor, lampholder and flasher; the dimensions of this display are 22 in. high by 16 in. wide. A new version of the dancing girl idea is embodied in what is called the "Mazda Girl and Lamp Cut-out." This cut-out is 18 in. high and consists mainly of a large Pearl lamp enclosing the charming figure of the famous dancing girl. There is also a new showcard, measuring 20 in. by 15 in. An entirely novel item is the "Mazda" cardboard sign for indoor purposes. Automobile lamp display advertising is represented by two highly attractive items—a striking cut-out and a showcard, giving full price information on the front with particulars of voltage and type of lamp cap for every make of motor vehicle on the back. The new edition of the complete "Mazda" lamp catalogue has 36 pages, and contains full information on all types of lamps; a thumb-index is included so that any page or section may be found instantly. For distribution overprinted in quantities, the B.T.-H. Company has issued a small envelope-sized card (No. L.546), containing all the essential information on Group I lamps, while a somewhat similar card (L.547), also available for overprinting, has been published in connection with motor-car bulbs.

**The "Mazda" illuminated cut-out display**

In connection with their 1932-33 lamp advertising campaign, Siemens Electric Lamps and Supplies, Ltd., are issuing some attractive publicity materials. In addition to the showcard illustrated there is a counter showcard of artistic design, featuring the "Popular Pair" children, and provided with two slots for holding price lists; a supply of overprinted price lists of pearl, opal and clear lamps (leaflet No. 531) and automobile lamps (leaflet No. 533) are also available. The new Siemens lamp window display has a very striking appearance and depicts the "Popular Pair" in fancy dress, seated on Siemens lamps. The display is in three vertical planes, illuminated at night by two 60-watt lamps. Flex, holders and adaptors are supplied wired for this purpose. A limited number of flashing signs are available for erection outside dealers' premises.

**The new Siemens lamp showcard**

## Multiple Toasters

In connection with our article in last week's issue on "Lighting the Garden," Messrs. Buchan, Cartwright & Co. inform us that they have taken over all of the patents, &c., of the former Electrical Utilities, Ltd., and are now manufacturing the multiple toaster mentioned.

## New Municipal Showrooms

On Monday the Tanfield (Co. Durham) Urban District Council Electricity Department opened a new showroom at the sub-station at Burnopfield.

Rawtenstall Electricity Committee has received sanction to a loan of £4,000 for the provision of an electrical showroom.

The Beckenham Urban District Council Electricity Department will move into its new High Street premises on September 1st.

## Economic Conditions in Jugoslavia

Mr. H. N. Sturrock, Commercial Secretary to H.M. Legation at Belgrade, has prepared a report for the Department of Overseas Trade on the economic conditions in Jugoslavia (H.M. Stationery Office, 1s. net). In this he states that Jugoslavia is now going through a period of strain and depression far more serious than any which it has hitherto experienced. The volume of foreign trade has been shrinking for the past several years. The imports of machinery, instruments, and apparatus into Jugoslavia during 1931 totalled 18,727 tons, with a value of 296,381,000 dinars, and of other electrical articles 4,831 tons and 185,945,000 dinars. For the first three months of the current year the imports of electrical goods totalled 762,980 kg., with a value of 33,373,929 dinars.

## The Brussels Radio Exhibition

The Commercial Secretary to H.M. Embassy at Brussels has forwarded to the Department of Overseas Trade a number of booklets, together with application forms, relative to the annual radio exhibition at Brussels, which is to be held from September 3rd-12th. Copies are available for loan on application to the Department, 35, Old Queen Street, S.W.1, or from the Secretariat Général, Avenue Fonsny, 59, Brussels.

## Annual Holidays

The works and offices of Birkbys, Ltd., will be closed from to-night, August 26th, to Monday, September 5th.

## For Sale

Hackney Electricity Department has generating plant for disposal.

(See our advertisement pages to-day.)

## Prices of Materials

Messrs. F. Smith & Co. report, August 24th: No change in the prices of silicium bronze wire and electrolytic copper.

Messrs. Edward Till & Co. report, August 24th: India-rubber. Para fine, 4¼d., ⅛d. inc.

Messrs. James & Shakespeare report, August 24th: Copper bars (best selected), sheet and rod, no change. English pig lead, £13 15s., 15s. inc.

## Prospects on the North-East Coast

An "Industrial Survey of the North-East Coast Area" has been prepared for the Board of Trade by Professor H. M. Hallsworth, head of the Department of Economics, Armstrong College Newcastle-on-Tyne (Stationery Office, 7s. 6d.). The industrial position of the district has been built up on coal, iron and steel, shipbuilding and repairing, and heavy marine and general engineering, which have suffered badly in the post-War depression. The district is divided into four regions: (1) Moorlands; (2) coal measures; (3) agricultural (Tees Valley in upper part); and (4) the Cleveland hills. The coalfields are the dominant factor, having 80 per cent. of the population, though only 25 per cent. of the land area of the four regions. The collieries are situated at maximum and minimum distances of 25 and 10 miles from the coast respectively. The annual output during the next five years is estimated at 50 million tons—the 1924 figure. It is anticipated that the coal reserves would maintain the present output for from 150 to 200 years, but the most easily won coal has been used up.

The iron and steel industry there has better equipped blast furnaces and steel works than in the country as a whole, but the output of pig-iron and steel ingots and castings has declined relatively to other districts. Considerable improvements in the organisation of this industry have taken place recently, chiefly in the direction of the grouping of the most important concerns. Little tendency towards co-operation has been shown in the shipbuilding industry. The capacity of the yards, as of the coal mines, is in excess of probable future demands either at home or abroad. The shipping industry depends for its prosperity largely on the others. In engineering the immediate prospects are not good—not even in electrical engineering. In both the capacity and supply of labour is in excess of the requirements, and in electricity the next two years will bring a decline in orders, as the construction of the grid will be completed, unless railway electrification is introduced.

The basic industries have to be scaled down to meet a diminishing demand, but the N.E. Coast should be able to maintain its pre-War proportion of the output of the whole country. There is a field for the exploitation of the other resources of the area, such as road material, building stone, and furnace refractories.

## Under-water Bath Lighting

An under-water lighting system making full use of the reflective properties of the water has just been completed at the Mile End Baths, London, E., by the Edison Swan Electric Co., Ltd. Ten 500-watt units are placed on opposite sides of the bath at intervals of 15 ft. and as close as possible to the surface of the water so that the light strikes the surface from below at an acute angle, the maximum light thus being reflected through the water to the other sides and bottom of the bath. The effect of taking full advantage of the reflective rather than the transmitting properties of the water-surface is that there is no waste of light in the area above water-level and consequently dazzle is avoided. The water itself is more effectively illuminated than by any other means, and the swimmer appears to the spectator to be bathed in a pool of golden light.

PRESTON CORPORATION ELECTRICITY DEPARTMENT
LANCASHIRE ELECTRIC POWER COMPANY
ELECTRICITY ON THE FARM
MAKERS TO GROW ABOUT

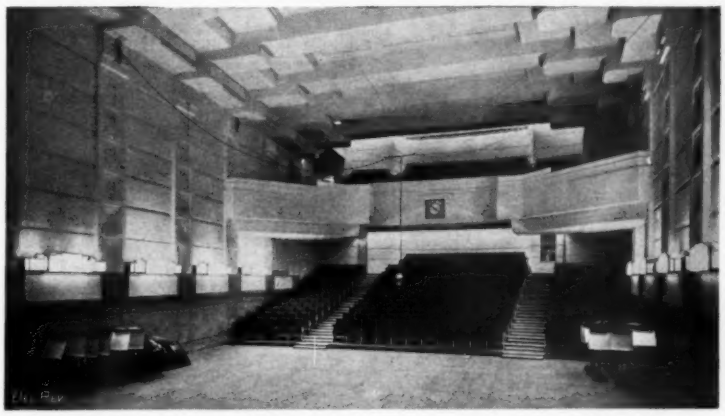
**A portion of the electrical exhibition at the recent Royal Lancashire Show, Preston, which was visited by 70,000 people**

## Floodlighting at Bognor Regis

Floodlighting as a seaside attraction is steadily gaining ground, and at Bognor Regis two novel schemes have just been completed. At the bathing beach by the Western Bandstand floodlight projectors employing 1,500-W lamps have proved very popular with night bathers during the warm weather, and hundreds of spectators have gathered to watch the fun. The other floodlighting illuminations are at the putting green in Waterloo Square, where players take full advantage of the innovation until a late hour.

## Miniature "Pivaspring" Instruments

The Park Royal Engineering Co., Ltd., has now transferred its instrument business to the Trafford Park Works of the Metropolitan-Vickers Electrical Co., Ltd. The complete range of Park Royal "Pivaspring" miniature instruments will continue to be manufactured, and all inquiries concerning any particular class or type of instrument should now be addressed to the Metrovick Meter and Instrument Department.



**The illumination of the main studio of the new Broadcasting House, London, is carried out by 36 stainless steel reflectors containing 150-W "Ediswan" pearl lamps**

## Employment During July

According to the *Ministry of Labour Gazette*, employment in the engineering industry generally during July showed a slight decline and was very bad, the total unemployed increasing from 270,382 to 275,087, and the proportion from 25.9 to 27.4 per cent. In electrical engineering, employment showed little change and was moderate, those out of work increasing from 15,074 to 15,163 (from 16.3 to 16.4 per cent.). There was a decrease from 15,500 to 14,558 (from 14.3 to 13.4 per cent.) in the electrical cable, wire and lamp manufacturing group, but in the electrical wiring and contracting industry the number of unemployed rose from 4,816 to 5,179 (from 21.4 to 23.1 per cent.).

## The G.E.C. Radio Demonstration Car

The well-known G.E.C. radio demonstration car has just undergone extensive overhaul, and all the interior shelving and wiring have been replaced by a modernist radio display, designed to give the trader an opportunity to inspect and test the 1933 "Gecophone" models with maximum facility and comfort. The car has just made its preliminary tour of the London area and a comprehensive tour throughout the country has been planned.

## Recent Contracts

Messrs. J. M. Voith, of Heidenheim, Germany, have been awarded the contract for the fourth unit at the Shannon power station. Previous machines have all been of the high-speed Francis type, but the new unit, as it is desired to use it for load regulation, will be of the Kaplan type. At the present time the maximum head under which this turbine will operate is 95 ft.; actually, however, it is being designed for the ultimate operating head, which is 106 ft. In point of size (the unit is of 30,000-h.p. capacity) other Kaplan turbines equal or exceed it, but this is so far the highest head under which any Kaplan turbine has been designed to operate.

The Llanelly and District Electric Supply Co., Ltd., through Messrs. Balfour, Beatty and Co., Ltd., has placed an order with Leyland Motors, Ltd., for the supply of fourteen "Leyland-G.E.C." four-wheel, double-deck trolley-buses.

Messrs. Austin & Co., Newcastle-on-Tyne, have received a contract from the L.N.E.R. Co. for eight electric lifts in connection with improvements being carried out at the Royal Station Hotel at Hull.

## New Zealand Radio Wiring Regulations

Copies of the new radio wiring regulations, which came into force in New Zealand on June 10th, are available for inspection and loan at the offices of the Department of Overseas Trade, 35, Old Queen Street, S.W.1.

## New Catalogues and Lists

**Bruce Peebles & Co., Ltd., Edinburgh.**—Leaflet No. 183, describing 1,000-kW remotely controlled rectifier equipment at Harrow.

**Philips Industrial,** 145, Charing Cross Road, W.C.2.—A folder containing particulars of public address equipment.

**English Electric Co., Ltd.,** Stafford.—Publications relating to oil-immersed switch-fuses, e.h.p. cartridge fuse, and the new tramcars put into service recently at Calcutta, Bombay, and Huddersfield.

**Bastian & Allen, Ltd.,** 26, Cross Street, N.1.—Leaflets giving particulars and prices of thermostatically controlled water heaters.

**British Insulated Cables, Ltd.,** Prescot, Lancs.—Catalogue No. C.I.E., dealing with motor-car, telephone and shot-firing cables, bell wires, &c.

**Credenda Conduits Co., Ltd.,** Oldbury, near Birmingham.—The new season's catalogue (No. HC6) of "Creda" electric fires, tubular heaters, and other heating and cooking apparatus.

**Ferguson, Pailin, Ltd.,** Higher Openshaw, Manchester.—Three leaflets relating to drawout enclosed switchgear and 130-kV oil circuit breakers as supplied for the North-West England grid.

## Bankruptcy Proceedings

**P. F. Chipps,** electrical engineer, 6, Oak End Way, Gerrards Cross, Buckinghamshire.—The public examination was held recently at the Town Hall, Windsor. The statement of affairs showed gross liabilities of £1,105, of which £1,048 was expected to rank for dividend. The net assets amounted to £56, so that there was a deficiency of £991. The debtor attributed his position mainly to the fact that his overhead expenses were too heavy for the amount of business done. He became aware of his position about two and a half years ago. The examination was adjourned for closing.

**G. A. Laird,** 118, Woodside Avenue, Coventry, and **D. Hyde,** The Cot, Meriden, near Coventry (trading as Burbury, Laird & Co., at 6, Warwick Row, Coventry), electrical engineers.—The first meeting of creditors was held at Coventry on August 18th, the Official Receiver (Mr. C. J. Band) presiding. Thirty-one proofs amounting to £1,940 were admitted. Mr. M. G. Dadley, Coventry, was appointed trustee, and a representative of each of Coventry Electric Appliances, Ltd., Messrs. Durant & Willitt, Birmingham, and the Electric Mechanical Supplies, Co., Coventry, as a committee of inspection.

**H. W. Martin** (London Radio Co.), wireless engineer, 209, Moulsham Street, Chelmsford.—Receiving order made August 11th on a creditor's petition.

**K. Beeson,** electrical contractor, 46, Main Street, Mexborough.—Discharge suspended for nine months to April 21st, 1933.

**R. D. Lewis,** electrical engineer, 72, Wallasey Road, Wallasey.—First and final dividend of 5¾d. in the £, payable August 24th at the Official Receiver's office, Government Buildings, Victoria Street, Liverpool.

## Company Liquidations

**Romney's (Manchester), Ltd.,** wireless and electrical dealers, &c., Manchester.—The statutory meeting of creditors was held recently at the Houldsworth Hall, Deansgate, Manchester, when it was reported that the liabilities were £2,158, of which £1,158 was due to the trade. The assets totalled £140, leaving a deficiency of £2,018 as regarded the creditors. The issued capital was £100, and the deficiency as regarded the shareholders amounted to £2,118. Resolutions were passed confirming the voluntary liquidation of the company, with Mr. L. Biltcliffe, Bolton, as liquidator, with a committee. The principal creditors are:—Philips Lamps, Ltd., £35; John Moores & Co., £160; E. K. Cole, Ltd., £40; Tomney's, £102; Hirst Ibbetson & Taylor, Ltd., £76; Hoover, Ltd., £70; Dulcetto Polyphon, Ltd., £164; Marconiphone Co., £43.

**Kinson Electrical Co., Ltd.,** 9, Brunswick Place, City Road, N.—The report of the Official Receiver (the liquidator) shows total liabilities £9,642 (ranking £9,531), assets £1,906, and a deficiency of £7,681 with regard to contributories. The failure of the company is attributed to the action of the principal creditor in causing an inquiry to be made into the company's dealings and transactions; to restrictions on the company's trading owing to the fact that it was not a member of the Radio Wholesalers' Federation; and to the fact that it began business without working capital.

**Baxter & Caunter, Ltd.**—Since the appointment of Mr. A. A. Lough as liquidator, in the voluntary winding up in June, negotiations have been concluded for the sale of the goodwill and certain other assets, and the business, as from August 22nd, will be carried on by the new company, bearing the same name, whose registration was announced in our issue of August 12th, page 236. The address is Darnoc House, Alfred Place, W.C.1. Telephone No.: "Museum 9301."

**Quickfix Electrical Fittings Co. (1928), Ltd.**—Messrs. Wm. J. McLaughlin & Lyons, liquidators, 193, St. Vincent Street, Glasgow, C.2, announce a second dividend of 6d. in the £.

## Dissolutions of Partnership

**Neon Installations,** 169, Regent Street, W.1.—Messrs. A. L. Josephs & L. M. Bonas have dissolved partnership. The former will attend to debts and carry on the business.

**Walters & Samuel,** electrical and wireless engineers, Rutland Street, Matlock.—Messrs. W. V. Walters and G. Samuel have dissolved partnership. Mr. Samuel will attend to debts and carry on the business.

**Kemp Brothers,** electrical engineers, Ashby Road, Coalville.—Messrs. R. J. Kemp, D. G. Kemp and W. Corah, have dissolved partnership. Debts will be attended to by Messrs. R. J. Kemp and Corah, who will carry on the business.

## Private Arrangement

**Boyce Bros., Ltd.,** electrical engineers, 52, High Street, Highgate.—A meeting of creditors was to be held on Wednesday last to consider a scheme prepared by the board of the company. In the notice convening the meeting it was stated that the company was suffering from a temporary shortage of working capital, and while the value of the assets exceeded the amount of the liabilities a forced sale would not be to the interest of the general body of creditors.

# Electricity Supply

## Lighting, Domestic, Power

**Barton-on-Humber.**—OVERHEAD LINES.—The Yorkshire Electric Power Co. has submitted to the Urban District Council plans for a proposed overhead line from South Ferriby to the Barton urban boundary.

**Basingstoke.**—COOKING INSTALLATION CONTRACT.—The Electricity Department has secured an order for a complete electric cooking installation and an all-electric water-heating installation for domestic purposes in connection with the remodelling of the Town Hall, Basingstoke. The total load is 60 kW.

**Brighton.**—ELECTRIC HEATING FOR CEMETERY CHAPELS.—The Corporation has considered a report of the borough surveyor submitting four alternative schemes for the heating alterations at the cemetery chapels: Heating by the low pressure hot water system, £405; with appliances for oil fuel burning, oil storage tank and running off the electricity supply, £690; adopting the existing heating chamber, with the necessary repairs, £220; and heating by electricity with tubes fixed under the pew seats and radiators in the vestries, £250. It was reported that the last-mentioned scheme would be the most economical one to adopt as at present there is no artificial lighting in the chapels. The Committee adopted the scheme for electric heating.

LOAN.—The Electricity Committee is to apply for sanction to borrow £15,164 for the change-over of the supply from d.c. to a.c. on the Stanford Estate.

COMPULSORY ACQUISITION OF LAND.—The Corporation has applied to the Electricity Commissioners for a Special Order authorising it to acquire lands at Southwick compulsorily for generating station purposes.

**Bromley.**—STREET LIGHTING IMPROVEMENTS.—Motor traffic through Bromley is heavy at all times of the year, but the recent introduction by the Corporation of a new system of "Wembley" street lighting has considerably lessened traffic congestion and promoted a higher degree of safety. The new installation consists of totally enclosed lanterns with asymmetric prismatic glass refractors and 500-watt lamps, the bulk being centrally suspended, some from pole to pole and others from wall to wall. The supporting cables are of copper-weld wire, which is a steel cored wire with an external covering of copper. The electrical conductors are led to the lanterns between the twin span wires, and these are held in position by porcelain cleats. The span wire gear is extremely neat in appearance. The scheme was prepared by the borough electrical enginer, Mr. W. G. Trend, with whom the G.E.C. collaborated, the erection of the equipment being carried out by Mr. C. W. Gosling, electrical contractor, Bromley.

**Burnley.**—REVISED TARIFFS.—The Electricity Committee has approved a revised tariff within the borough only on the rateable value system of charge for private houses. The fixed annual charge based on rateable value is to be as follows:—On the first £15 of rateable value a fixed charge of 20 per cent. per annum with a minimum charge of £2; on the next £15 15 per cent.; next £20, 10 per cent.; next £30, 7½ per cent.; above £80, 5 per cent. The "unit" charge is to be ½d.

MUNICIPAL COLLEGE HEATING.—It has been decided to install electrical heating at the Municipal College.

LOAN.—The Electricity Committee is to seek sanction to a loan of £25,000 for mains and services.

**Carlisle.**—CHURCH INSTALLATIONS.—The Chancellor of the Diocese has granted facilities for the installation of electricity in the Allthwaite, Authure, and Pennington churches.

**Charlesworth** (Derbyshire).—STREET LIGHTING.—At the recent meeting of the Parish Council it was decided to accept, under a five-years' agreement, the tender of the Trent Valley & High Peak Electricity Co., Ltd., for street lighting throughout the parish. This brings the total of street lighting contracts obtained by the company during the 2½ years they have been operating in the Derbyshire and Cheshire areas to nine, whilst three street-lighting contracts have been obtained in their Staffordshire area.

**Continental.**—RUSSIA.—According to the latest information three generating units have already been put into commission at the Dnieprostroi hydro-electric power station. Two of these units are working and one is in reserve. The fourth unit is being at present tried out and the fifth set will be ready by the end of this month. Owing to the fact, however, that the principal consumers are not yet ready to receive supplies, the load of the station is only about 20,000 kW at present, of which 12,000 kW is transmitted to Dniepropetrovsk and 8,000 kW is being consumed on the site. The 154,000-V transmission line from the main sub-station to the Junction sub-station in Dniepropetrovsk has also been completed and put into commission, as well as some of the step-down sub-stations and part of the local ring in Dniepropetrovsk. It is expected that the 154,000-V transmission line across the Dniepr will be completed this month.

The site of the proposed hydro-electric power station on the River Volga has now been finally chosen near the village of Vasiliev, 75 km. from Nijni-Novgorod. The station will have a capacity of 200,000 kW and is scheduled for completion in 1935. Work will commence this month.

The Council of People's Commissaries of the Soviet Govern-

ment recently issued a decree concerning the construction of a large hydro-electric station to provide for the irrigation of an area of about 11,250,000 acres of steppe land for wheat growing on the left bank of the River Volga. The new station, which is to be built at Kamyshin, will have a capacity of 2,000,000 kW (nearly four times the size of the Dniepr hydro-electric station). The construction will involve the building of a dam two miles in length and 98 ft. in height. The whole enterprise is to be completed in 1937.

LITHUANIA.—A report in the *Financial Times* states that the American Foundation Company has made an offer to the Latvian Government to arrange a foreign loan through Anglo-American bankers to enable Latvia to harness the Dwina rapids and erect the largest power station in Eastern Europe. The offer is made on condition that the Latvian Government employs the entire loan for this purpose and entrusts the work of construction to the company.

**Disley.**—OBJECTION TO OVERHEAD LINES.—The Rural District Council is to object to the erection of overhead lines over part of Disley by the Trent Valley and High Peak Electricity Co., Ltd., on the ground of the possible danger to life and property which may result on account of the narrowness of the road along which the poles would be erected.

**Droxford.** — PROSPECTS OF SUPPLY.—The West Hampshire Electricity Co., Ltd., is about to commence work in connection with an electricity scheme for the district.

**Flamstead (Herts).** — SUPPLY NEXT YEAR.—The Luton Corporation Electricity Department has informed the Hemel Hempstead Rural District Council that a survey of the transmission line from Cheverells Green to Flamstead is to be commenced forthwith, and provided no difficulty is encountered in obtaining wayleaves it is hoped to have a supply available in Flamstead at the beginning of next year.

**Glasgow.** — PROGRESS DURING JULY.—Under the Electricity Department's scheme 42 houses were wired in July, making the total to date 36,286. Hired appliances now number 19,479.

EXPENDITURE FOR 1932-33.—The revenue and expenditure of the Electricity Department for 1932-33 has been estimated as follows:—Revenue, £1,250,155 and expenditure £1,212,155, leaving a surplus of £38,000. Capital expenditure has been estimated at £103,000, of which £65,000 is to be met out of loans, and £38,000 out of revenue.

MAINS EXTENSIONS.—The Electricity Committee has agreed to lay distributing mains at a cost of £4,016.

CLOSING OF PORT DUNDAS STATION.—The plant at Port Dundas station has been closed down as the station is no longer required by the Central Electricity Board. It is proposed that the staff at Port Dundas should be absorbed as far as possible in other sections of the Electricity Department.

**Haydock.**—STREET LIGHTING.—Preparations are being made for installing electric street lighting. The Lancashire Electric Power Co. has agreed to have the scheme completed by September 1st.

**Hudderfield.**—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £10,000 for sub-stations and equipment.

**Isle of Wight.**—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Isle of Wight Electric Light and Power Co., Ltd., to supply electricity in the administrative county of the Isle of Wight.

ELECTRIC LIGHTING AT THE INSTITUTION.—The Public Assistance Committee has empowered a sub-committee to prepare a scheme and detailed report for the provision of electric lighting at the Institution.

**Kent.**—SUPPLY FAILURE.—A large area of West Kent was in darkness for an hour on Monday night owing to a distribution fault. Orpington, Sidcup, Petts Wood, St. Mary Cray and Farnborough were affected.

**Littlington (Sussex).**—PLANS FOR SUPPLY APPROVED.—The Eastbourne Rural District Council has approved plans for a supply to Littlington by means of overhead lines.

**Macclesfield.**—PURCHASE OF UNDERTAKING.—With reference to the negotiations for the purchase of the undertaking of the Electricity Co. of Macclesfield by the Corporation, the company has informed the town clerk that it is not prepared to sell on the ground that the notice given by the Corporation of its intention to purchase is not valid. The Electricity Committee has decided to take Counsel's opinion before proceeding farther, and if this opinion is favourable, the Corporation will proceed to acquire the undertaking by arbitration.

**Manchester.**—PROGRESS DURING JUNE.—During June the Electricity Department increased its connections by 3,275 kW, making a total of 506,237 kW. Applications for supplies (including additional supplies) numbered 1,699, representing a total of 3,483 kW. There were 213 orders for the hire of cookers, bringing the total on circuit to 9,965, while applications for hired cookers amounted to 236. Two new sub-stations were put into commission and new plant was installed at the sub-station of Messrs. G. Chadwick & Co.

**Merthyr Tydfil.**—LIGHTING CONTRACT.—The Town Council has renewed the contract with the Merthyr Electric Traction and Lighting Co., Ltd., for a portion of the public lighting.

**Penzance.**—REVISION OF CHARGES.—At the August meeting of the Town Council, a sub-committee of the Corporation Lighting Committee reported having interviewed Mr. A. L. Hards, of the Cornwall Electric Power Co., Ltd., and gave him definitely to understand that the question was being seriously considered of obtaining a ministerial inquiry for the revision of the electricity charges in Cornwall. Mr. Hards asked for time to lay the matter before his directors, and it was resolved that failing a satisfactory reply from the company, the Committee be empowered to open negotiations with a view to such an inquiry being held.

**During the past two or three weeks the ruins of Whitby Abbey, Yorkshire, and the neighbouring St. Mary's Church have been floodlighted with excellent results. A night view of the Abbey appears above.**

**Portsmouth.**—CHANGE-OVER.—The Corporation has notified its intention to change the supply over from 100 V, 220 V and 240 V, single-phase and 415 V 3-phase at 50 cycles to 230 V single-phase and 400 V 3-phase at 50 cycles. The Corporation is carrying out the necessary alterations to consumer's apparatus.

**Rawtenstall.**—LOAN SANCTIONED.—The Town Council has received permission to borrow £21,414 for the provision of new switchgear and buildings.

**Shedfield.**—PREPARATIONS FOR SUPPLY.—Steps are being taken by the West Hampshire Electricity Co., Ltd., to give a supply of electricity to the village, consent having been obtained for the erection of overhead lines.

**Sculcoates.**—OVERHEAD LINE OBJECTION.—The Rural District Council has again refused to consent to the erection of overhead cables along the Hessle and North Ferriby Road, although the cost of laying underground cables would be prohibitive, and the decision of the Rural Council will deprive residents of a supply of electricity.

**Singapore.**—YEAR'S WORKING.—Mr. E. W. P. Fulcher, the municipal electrical engineer, has issued his annual report, which shows a revenue of $2,278,139, and a working expenditure of $881,864; there was a surplus of $85,833. A total of 26,720,673 kWh of electricity was sold, as compared with 26,135,192 kWh in 1930.

**Southall.**—HOUSE INSTALLATIONS.—It has been decided to install electric lighting in houses in Western Road, Heathway and Manor Way at the expense of the tenants.

**Southend-on-Sea.**—OFFER TO PURCHASE UNDERTAKING.—The Town Council has decided not to entertain an offer to purchase the electricity and transport undertaking.

LOAN.—The Town Council has applied for an additional loan of £10,000 for change-over purposes. H.p. mains are to be laid in the London Road generating station to the Pier Hill sub-station at a cost of £1,493.

**Southport.**—REPORT ON STREET LIGHTING.—The Lighting Committee has asked the gas and electrical engineers to present a report on the lighting of Cambridge Road, using the tramway standards for central lighting, or alternatively, additional lamp standards on the footpaths.

**Tenterden.**—SUPPLY TO ROLVENDEN.—The Rural District Council has decided to approach the Weald Electricity Supply Co., Ltd., with regard to a supply of electricity for Rolvenden, Layne.

**Tynemouth.**—LOAN.—The Electricity Committee is to apply for sanction to a loan of £7,000 for meters.

# Traction

**Brighton.**—TRACK RENEWAL.—The Tramways Committee is to apply for permission to construct a double track between the big railway bridge and the Seven Dials.

**Canada.**—TRAFFIC ON ELECTRIC RAILWAYS.—Passenger traffic on the electric railways showed a further decrease in 1931, says *Reuters Trade Service* from Ottawa, the total number of passengers carried being 720,468,361, against 792,701,493 in 1930. The latter figure in its turn represents a loss of 40,795,373 on 1929. None of the railways showed an increase; the individual losses ranged from 4.2 per cent. to 18.5. The Montreal Tramways carried nearly a third of all the traffic, and the Toronto system a trifle more than a quarter.

**Continental.**—RUSSIA.—Moscow's first tube station is now being built as part of a great plan for an underground railway to relieve traffic problems. Already 20 shafts have been sunk, and two of them completed, for the first section of the line, while a tunnel is being dug at one of the terminals. Altogether 32 shafts will be necessary for this section of the line. When the railway is finished, the lines will be arranged like the spokes of a wheel, converging towards the centre of the

**Big Ben is now heard regularly in the Tottenham Court Road area, the Marconiphone Co. having secured permission to install a microphone in the Clock Tower and run a line from it to the large loud-speaker equipment illustrated above, on the roof of the company's headquarters**

city. Materials and equipment are being brought to the spot, and some seven miles are to be completed by the end of next year. This forecast is made by Mr. Rottert, the chief engineer for the building of the underground railway. He was formerly assistant chief engineer for the building of the Dnieprostroy spillway. At the end of 1936, the length of the tube railway will reach 36 miles, and a year later over 50 miles. The total cost of construction is expected to exceed £140,000,000. Owing to the peculiar substrata of Moscow—chiefly sand containing much water—neither the London system of tube construction nor that used anywhere in Western Europe or America has been found altogether suitable. British, French and German experts have all been consulted, and advantage is being taken of the pooled experience of the world in the building of the railway. The French and German experts are in favour of the tube being built just below the surface, while the British experts are still working on the project and have not yet given their final opinion. Some of the British experts, however, have suggested a combination of deep-lying and sub-surface tracks, and apparently this is the method which will be used. One-third of the first line—that is, over two miles—will be built in accordance with the London method of deep-lying tracks.—*Reuter* (Moscow).

**Irish Free State.**—APPLICATION OF DRUMM BATTERY TO ROAD VEHICLES.—It is believed that Dr. Drumm, the inventor of the Drumm battery at present used on two trains running on the Great Southern Railway, is turning his attention to the application of this battery to road vehicles.

**Japan.**—RAILWAY ELECTRIFICATION.—The I.G.R. has approved estimates for the electrification of the Suita-Takatori line. 1,194,000 yen is for the cost of the sub-stations, 1,631,000 yen for the trolley lines, 150,000 yen for automatic signals, and 2,490,000 yen for provision of new cars.

**Keighley (Yorkshire).**—TROLLEY-BUS ABANDONMENT.—The Town Council has reached an agreement on the amalgamation of its omnibus undertaking with that of the West Yorkshire Road Car Co., Ltd., and it has been decided to scrap the Council's trolley-bus system.

**London.**—UNDERGROUND EXPERIMENT.—The Metropolitan Railway Co. is experimenting with windows fitted in the roofs of the carriages in order to provide better lighting when the train is in a station. At present two coaches running on the service between Uxbridge and the City have been fitted and the results are considered satisfactory.

**L.M.S. Railway.**—BARKING ELECTRIC SERVICE EXTENSIONS.—The company announced on Monday that the electric service between Barking and Upminster will commence on September 12th. Preliminary tests began on Monday.

**Wimbledon.**—TRAMWAY ALTERATIONS.—The Highways Committee has approved a proposal that the Council should contribute £1,000 to the London United Tramway Co. towards the cost of constructing a temporary tramway terminus and turning circle for trolley-buses outside the Town Hall, the tramway company undertaking to use its best endeavours to secure permission for the removal of the tramway track over the railway bridge to the foot of Wimbledon Hill.

# Communications

**Algiers.**—SUBMARINE CABLE.—The laying of the Oran-Marseilles submarine cable, *via* the Balearic Islands, was completed on August 18th, says *The Times*. The cable was made in England and will be taken over by the French Government after tests have been carried out.

**Droitwich.**—NEW BROADCASTER.—The B.B.C. is negotiating for a site at Droitwich on which it is to build a new broadcasting station with dual transmitters. One will be of 100 kW, use a long wave, and take the place of the Daventry (5 XX) station. The other will be of 70 kW, use a medium wave, and serve the Midland Regional area. The Daventry site will thus be freed for the new Empire transmitter.

**Germany.**—RADIO EXHIBITION.—The annual Wireless Exhibition was opened on the Berlin Municipal Exhibition ground on August 19th.

The Berlin correspondent of the *Morning Post* says that it was pointed out in the course of the speeches that whereas only 23 per cent. of German households are equipped with radio, 53 per cent. of American households are thus furnished and 57 per cent. of Danish households. The German industry claims to have produced 26 per cent. of the wireless equipment of the world last year.

THE NEW FRANKFURT TRANSMITTER.—The new broadcasting station at Frankfurt commenced experimental transmissions this week with an output increased from 1.7 to 17 kW. The station is using the former Leipzig wavelength (259.3 metres), while Leipzig is to change over to Frankfurt's wavelength—389.6 metres.

**Great Britain.**—RADIO EXCHANGES.—Tadcaster Rural Council has received on application from a Burnley firm for permission to establish a relay service in the town. While the application is not objected to, it was referred to the County Council.

Wimbledon Corporation has approved of the conditions under which Wireless Service, Ltd., will provide two programmes simultaneously, subscribers having the choice of either. All installations are to be put in free of charge, and the service rent is to be fixed at a maximum of 1s. 6d. per week, the company to have the sole rights of distribution in the borough for a period of ten years.

The Plymouth radio exchange was opened last week.

**London.**—TELEVISION.—A new series of experimental transmissions of television by the Baird process was commenced last Monday under the auspices of the B.B.C. Performances by artists at Broadcasting House will in future be transmitted from 11 to 11.30 p.m. on Mondays, Tuesdays, Wednesdays, and Fridays, sound being broadcast on 398.9 metres and vision on 261.3 metres.

**Scotland.**—RADIO TEST TRANSMISSION.—The B.B.C. National transmitter in Scotland commenced reception-test radiations this week on a wavelength of 288.5 metres. A wavelength of 376.4 metres is used by the Scottish Regional transmitter.

**Spain.**—RADIO CONFERENCE.—The International Radio Conference is to open at Madrid on September 3rd. Some 500 delegates are to attend the meeting, representing 125 nations.

**A police control taking part in the demonstration at Newcastle-upon-Tyne (see last week's issue, p. 264) of new radio apparatus which enables headquarters to keep in touch with patrols within a radius of ten miles. The aerial is seen on the sidecar**

# Contract Information

*When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below*

## Contracts Open

**Aldershot.**—September 6th. Town Council. Lighting installation at East End Schools. (August 19th.)

**Australia.**—MELBOURNE.—October 4th. Posts and Telegraphs Department. Switchboard and instrument plugs. (A.X. 11427).* Instrument cords. (A.X. 11428.)*
October 11th. Condensers. (A.X. 11436.)*
October 25th. Telephone receivers and parts (A.X. 11452)* and telephone transmitters, &c. (A.X. 11453.)*
October 10th. City Council. Metal-clad switchgear, &c. (A. 11467.)*

**Belgium.**—BRUSSELS.—September 26th. Power station for the Hôpital, St. Pierre (estimated cost 1,000,000 francs). M. le President, la Commission d'Assistance, Publique de la Ville de Brussels, 46, Boulevard du Jardin Botanique, Bruxelles (A. 11468.)*

**Devon.**—August 29th. County Council. Traffic signals. (August 19th.)

**Dumfries.**—August 27th. County Council. Electric wiring installation work under assisted wiring scheme. Mr. J. S. Pickles, county electrical engineer, Marchmount, Dumfries.

**East Lothian.**—September 12th. County Council. Various works, including electrical installation, at new school, Prestonpans. Messrs. R. and A. K. Smith, 4, Forres Street, Edinburgh.

**Edinburgh.**—August 27th. Corporation. Heating and electric lighting installation at additions to Stenhouse School. City architect, City Chambers.
September 3rd. Electric goods lift at new public washhouse at Union Street. City architect.

**Egypt.**—ALEXANDRIA.—October 1st. Director-General of Ports and Lighthouses. Electric lighting of the Port of Alexandria. (A. 11462.)*
CAIRO.—October 17th. Director of Stores, Department of Public Health. X-ray apparatus and accessories. (A. 11458.)*

**Galloway.**—August 30th. Galloway Water Power Co. Construction of Tongland aqueduct. Sir Alex. Gibb and Partners, Queen Anne's Lodge, Westminster, S.W.1 (deposit £10 10s.).

**Hoylake and West Kirby.**—August 29th. Urban District Council. Supply and laying of armoured submarine cable to a light on groyne off Meols Parade. Engineer and surveyor, Town Hall.

**India.**—SIMLA.—October 4th. Indian Stores Department. Four 3-ton level luffing electric quay cranes, portal type. (A.X. 11447.)*
NEW DELHI.—December 5th. Indian Stores Department. A.c. ceiling fans. (A.X. 11461.)*

**Irish Free State.**—DUNDALK.—September 10th. Electrical installation at Ardee Mental Hospital. Messrs. J. P. Tierney & Co., 44, Kildare Street, Dublin (deposit £5 5s.).

**Kettering.**—September 1st. Electricity Department. Renewal of positive battery plates. (August 12th.)

**Kirkcudbright.**—September 13th. County Council. L.p. overhead and underground distribution lines and services, 11,000-V underground cables, and a kiosk sub-station. (See this issue.)

**London.**—CENTRAL ELECTRICITY BOARD.—August 31st. Lighting equipment and special fittings for the central control room and offices at Bankside. (August 19th.)
BATTERSEA.—September 21st. Borough Council. Electric travelling crane and rubber band conveyor. (See this issue.)
September 16th. Metropolitan Water Board. Electrically driven pumps and a 50-kW turbo-generator. Chief engineer, 173, Rosebery Avenue, E.C.1 (deposit £2 2s.).
August 30th. Madras and Southern Mahratta Railway Co., Ltd. Lamps. (August 19th.)
September 30th. South Indian Railway Co., Ltd. Steel coaches, electrical control and traction equipment. (See this issue.)

**Manchester.**—August 29th. Electricity Department. Testing equipment and 6,600-V sub-station switchgear. (August 12th.)

**New Zealand.**—INVERCARGILL.—October 10th. Tramways and Electricity Department. Switchgear. (A. 11454.)*
INVERCARGILL.—October 10th. City Tramways and Electricity Department. Single-phase transformers. (A. 11455.)*

**Oldham.**—September 15th. Public Assistance Committee. Lamps and fittings for the Institution, Rochdale Road. Public assistance officer, Rochdale Road.

**Plymouth.**—August 29th. Corporation. Electricians' materials, &c. Mr. R. J. Fittall, town clerk, Municipal Buildings.

**Portsmouth.**—September 19th. Electricity Department. Automatic reversible battery booster and control gear. (See this issue.)

**South Africa.**—JOHANNESBURG.—September 15th. City Council. Two 1,080-kVA transformers. (A.X. 11445.)*
September 24th.—6,600-V and 660-V cables (A. 11457)* and metal-clad switchgear units (A. 11456.)*
September 19th. South African Railways and Harbours. Lamps. (A.X. 11446.)*

**Southampton.**—August 31st. Corporation. Electrically driven centrifugal pump. Borough engineer, 33-35, French Street, Southampton (deposit £3 3s.).

**Southend-on-Sea.**—September 8th. Electricity Department. H.p. and l.p. cables. (August 5th.)

**Stornoway.**—September 3rd. Town Council. Wiring for electric lighting at housing scheme. Burgh surveyor, Municipal Buildings, Stornoway.

**Sunderland.**—September 5th. Corporation. Insulated cable and wire, meters and lamps. (August 12th.)

**Warrington.**—September 5th. Electricity and Tramways Committee. Cables, conduits, and reinforced concrete cable protector slabs and tiles. (August 19th.)

**Whitehaven.**—Electric Supply Department. E.h.p. and l.p. switchgear, transformers and accessories. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

## Contracts Closed

**Deptford.**—Highways Committee. Recommended. Automatic traffic signals at New Cross. Signals.—Chance Bros. and Co., Ltd., Smethwick; cable work, &c.—London Electric Supply Corporation, Ltd.

**Glasgow.**—Transport Committee. Accepted. Special trackwork.—Edgar Allen & Co., Ltd.; Hadfields, Ltd.; Titan Trackwork Co., Ltd.
Markets Committee. Accepted. Electric lighting at fish market sale room (£88).—Johnston Park & Co., Ltd.
Education Committee. Accepted. Electrical work at St. Thomas's school (£495).—D. A. M'Larty. Electrical work at Carnwadric school (£514).—D. Henderson.
Housing Committee. Accepted. Electrical installation at housing schemes.—R. J. Sinclair (Glasgow), Ltd. (140); Alex. A. Moore (£503); Colquhoun & M'Arthur (£92); D. Henderson (£2,144).

**Government Contracts.**—The following contracts were placed by the various Government departments during July:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Electric cable.—Hooper's Telegraph & India Rubber Works.
Circuit breakers.—Allen West & Co.
Electric lamps.—G.E.C.; B.T.-H. Co.; Siemens; Ediswan.
Electrically driven winches.—Napier & Co.

WAR OFFICE.

Batteries and cells.—Siemens Bros.
Dry battery refills.—Britannia Batteries.

AIR MINISTRY.

Batteries.—C.A.V.-Bosch; Siemens Bros.
Battery charging panels.—Erskine, Heap & Co.
Helmet telephone fittings.—Siemens Bros.
W/t. receivers.—Muirhead & Co.
W/t. valves.—A. C. Cossor; Ediswan.

CROWN AGENTS FOR THE COLONIES.

Insulators.—Bullers, Ltd.
Sub-station equipment.—B.T.-H. Co.

POST OFFICE.

Protective apparatus.—Phœnix Telephone & Electric Works.
Telegraphic apparatus.—Creed & Co.
Telephone apparatus.—Automatic Electric Co.; Ericsson Telephones; G.E.C.; Plessy Co.; Siemens Bros.; Standard Telephones & Cables; Telephone Mfg. Co. (1929).
Terminal clocks.—Thomas de la Rue & Co.; Hall Telephone Accessories (1928).
Cable.—B.I. Cables; Callender's; Connollys (Blackley); G.E.C.; Henley's; Standard Telephones & Cables; Telegraph Construction & Maintenance Co.
Telephone cords.—Phœnix Telephone & Electric Works; Reliance Electrical Wire Co.
Charging panels.—Power Equipment Co.
Earth plates.—Bullers.
Rectifiers.—Ediswan.
Repairing battery at Fenny Stratford repeater station.—Alton Battery Co.
Conversion of lifts at money order office, Holloway, to d.c.—W. Wadsworth & Sons.
Electric lifts, G.P.O. (South), E.C.—J. Bennie, Ltd.
Loading coils and terminations.—Derby-Leeds cable (Leeds-Barnsley section): B.I. Cables. (Derby-Barnsley section): United Telephone Cables.
Telephone exchange equipment.—Bowes Park.—G.E.C. Pill (Bristol automatic area).—Automatic Electric Co. Marston Green (Birmingham area); Larkswood (London area); Newcastle-upon-Tyne trunk exchange: Ericsson Telephones. Stainland (Halifax area); Nottingham trunk exchange; Newcastle-on-Tyne trunk exchange; Birmingham trunk exchange.—Standard Telephones & Cables.
Telephonic repeater equipment.—Birmingham: G.E.C. Edinburgh: Standard Telephones & Cables. Sub-contractors for Edinburgh: Chloride Electrical Storage Co. for batteries; Mortley, Sprague & Co. for motor generator sets.
Transformers, e.h.p. oil switch-fuse units, &c., Aston Cross (Birmingham) telephone exchange sub-station.—Ferguson, Pailin.

**Lincoln.**—Bracebridge Mental Hospital Visitors. Accepted. X-ray apparatus for the new admission hospital (£687).—Watson & Sons, Ltd.

## Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

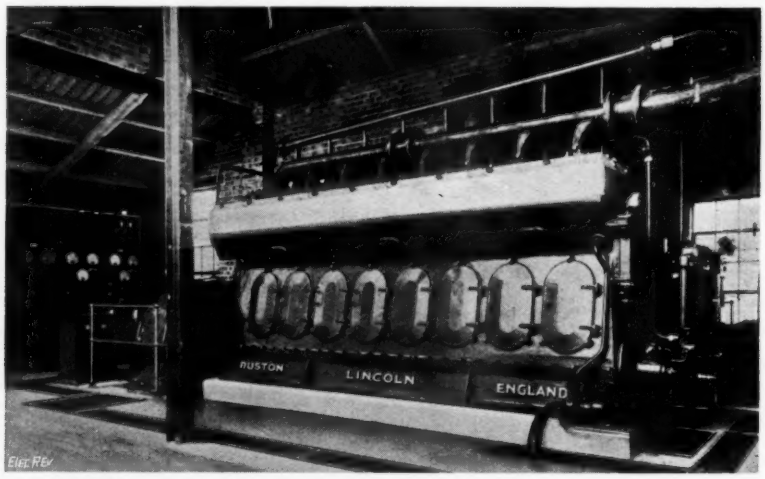
We shall be glad to learn the name and address of the makers of the following:—

CARLTON PIERRE electrical fittings.
BOULA reflector lamp.
T.X (ONE-TWO) switch adaptor.
BEAM bowl fire.

# Notes

## Progress in Switzerland

The Geneva correspondent of the *Morning Post* reports the completion of the conversion of a further section of the Federal Railways from steam to electricity at a cost of £8 million; this brings the proportion of electric traction in Switzerland to 85 per cent. of the total traffic. In 1931 some 119,000 electric heating plants were installed, 5,000 more than in the previous year, bringing the total to more than 1,700,000. Last year electricity consumption rose to 3,780 million kWh, an increase of about 100 million. Including the output of the hydro-electric stations of the railways, the total consumption exceeded 5,000 million kWh. Telephone traffic increased in 1931 by 11 per cent. for international, 8 per cent. for trunk, and 9 per cent. for local calls.




**An eight-cylinder Ruston engine similar to those being supplied for Basrah**

## Electricity and Smoke Abatement

The chief sanitary inspector of Aberdeen, in his annual report, says that the severe depression in trade has reduced the number of new connections to the electricity supply mains for power purposes. Electrically driven works running at low output, however, are enabled to work economically without polluting the atmosphere by smoke from boilers, which would have to remain in commission on a steam plant so long as any work whatever was being done. On the domestic and office side of the business, steady progress continues to be made in the use of electricity for heating purposes. Installations of electric tubular heaters have been completed, while schemes for others are likely to be put in hand very shortly.

## Educational

REGENT STREET POLYTECHNIC, W.1.—Day courses in all branches of electrical engineering will commence on September 20th and prospectuses may be obtained on application to the Director of Education. The Evening Department reopens on September 26th, enrolment commencing on September 19th.

(See our advertisement pages to-day.)

## Appointments Vacant

Power station shift charge and repairs and maintenance engineers, mains maintenance shift engineer, and technical and meter assistant for Sheffield Electric Supply Department.

Junior engineer in Consumers' Engineer's Department and junior charge engineer in the generating station of Portsmouth Electricity Department.

Female demonstrator and showroom assistant for Rawtenstall Electricity Department.

Test room assistant for Hull Electricity Department.

Shift charge engineer for Halifax Electricity Department.

Shift engineer for Darwen Electricity Department.

(See our advertisement pages to-day.)

## 3,000,000-kVA Circuit-breakers

The 132-kV circuit breakers which are in commercial operation on the British grid system are rated at 1,500,000 kVA and employ explosion pots or multi-break type contacts. At the Roseland switching station belonging to the Public Service Electric and Gas Company, U.S.A., there are six oil circuit breakers having an interrupting capacity of 3,000,000 kVA at 220 kV. These are the largest switches ever constructed, and since their installation in 1930 have operated successfully on all short-circuits at very high speeds.

In order to maintain system stability they were designed to clear faults above 25 per cent. of their rating in a maximum of eight cycles (0.133 sec.) from the instant of energising the trip coil. Insulation tests were carried out at 570 kV for one minute. They were manufactured by the Westinghouse Electric and Manufacturing Co., and, according to the *Electric Journal*, the tanks are 17.5 ft. high, 10 ft. in diameter, and constructed of welded steel plate to withstand hydraulic test pressures of 250 lb. per sq. in. Each weighs over 22,000 lb. and contains 6,600 gal. of oil.

To obtain the high speed of operation a helical steel operating spring is used, which develops a force equivalent to 10,000 lb. on the solenoid pull rod. In addition, certain of the highly stressed components are made of special heat-treated steels to reduce weight. The breakers are fitted with de-ion grid contacts and have a full break of 43.5 in.; the moving contacts are brought smoothly to rest during the last two inches of travel by oil dashpots.

## Ruston Engines for Basrah

Modern oil engine generating plant is to be installed at Basrah, Iraq, for generating electricity for the port at low cost. At present a supply of electricity for the locality is generated by means of steam-driven plant, but the Crown Agents for the Colonies have placed an order with Ruston & Hornsby, Ltd., for five oil engines to be installed in a new power station of the Basrah Port directorate. When the new station is in operation power and light will be available for all users in the district, but the primary object of the scheme is to provide power for the various works at the port.

All the engines in the new station are to work on the well-known principle of airless injection, using the cheapest grades of fuel-oil. Two of the five engines will be 8-cylinder units of 440 b.h.p. working load, each directly coupled to a 250-kW alternator; two will be 4-cylinder units of the same range, each directly coupled to a 125-kW alternator, the remaining engine being a 4-cylinder unit of 120 b.h.p. directly coupled to a 65-kW alternator, the whole series being arranged to supply lighting and power circuits in parallel with each other; it will be capable of dealing with a maximum load of 815 kW.

In addition to the main generating sets mentioned above, the contract covers the installation of accessory plant, such as exhaust and cooling water arrangements, compressed air starting equipment, and an emergency lighting set, as well as fuel-oil and lubricating oil purifying apparatus. Messrs. Preece, Cardew & Rider are the consulting engineers.

The accompanying illustration shows an 8-cylinder engine, similar to the main units for Basrah, generating electricity for the production of British talkies at the studios of Sound City, Ltd.

## Automatic Air Circuit Breakers

The chief application of air circuit breakers is at rural distribution sub-stations, including transformers at consumers' sub-stations, line sectionalising equipments, and sub-stations serving small farms.

The phases of the automatic air circuit breaker are mechanically coupled to operate simultaneously as a three-phase unit, and fitted with special arcing horns. The tripping devices employed by one manufacturer consist either of series overload coils in the high-voltage line, where overload protection alone is required, or specially designed current transformers and time-delay relays, where inverse or delayed-time characteristics are desired. Both spring and motor mechanisms are obtainable, but the former type is not reversible, and requires manual site operation to reclose the breaker.

Considerable operating experience and numerous tests have proved air circuit breakers to be capable of dealing successfully with loads ranging from 25,000 kVA to 100,000 kVA at from 15 kV to 110 kV. Tests carried out by the Railway and Industrial Engineering Company also proved that these breakers could handle three-phase short circuits of 220,000 kVA at 26 kV. In these tests, vertical break switches having 10-ft. horns with 18-ft. 6-in. gaps were used, and all arcs (of values up to 4,700 A) were extinguished in less than one second after the circuit breaker started to open. The wind velocity at the time was 4.75 m.p.h., blowing parallel to the switch bases.

The capacities that automatic air circuit breakers are capable of handling with a high degree of reliability were shown by these tests to be as follows:—

| KV. | Phase Spacing (ft.) | Safe Circuit: Standard Breakers (1) | Safe Circuit: Special Breaker (2). |
|---|---|---|---|
| 15 | 5 | 400 | 800 |
| | 8 | 800 | 1,500 |
| | 10 | 1,200 | 2,000 |
| 23 | 6 | 400 | 600 |
| | 8 | 600 | 1,000 |
| | 10 | 1,000 | 1,500 |
| 34 | 7 | 400 | 600 |
| | 8 | 600 | 1,000 |
| | 10 | 800 | 1,500 |
| 46 | 8 | 400 | 60 |
| | 10 | 600 | 1,000 |
| 69 | 8 | 400 | 600 |
| | 10 | 600 | 1,000 |

(1) Opening 90 deg. (2) Opening 120 deg.

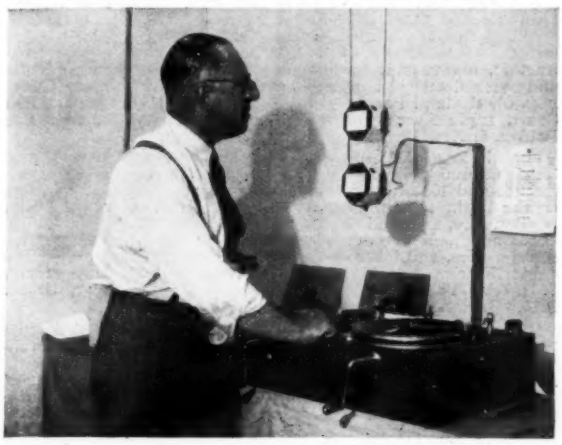
## Dublin Wireless Exhibition

The Irish Wireless and Gramophone Exhibition is to be held at the Mansion House, Dublin, from September 19th to 24th.

# Our Personal Column

**Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements**

**Mr. John A. Wallin** has retired from the electrical department of Lever Bros., Port Sunlight, after 30 years' service, during which time he has had the supervision of the electrical equipment throughout the factory. He has been presented with a radio set and a barometer as parting gifts.



**Mr. J. Y. Fletcher, a director of the General Electric Co., Ltd., speaking from the Radio Exhibition at Olympia last Tuesday to the White Star liner "Homeric" situated some 1,500 miles from England. The conversation was broadcast to the passengers on board.**

Mr. B. T. Hawkins, borough electrical engineer and manager of the Wallasey Corporation, a few days ago presented three members of the commercial staff with gifts to mark the occasion of their coming marriages. **Mr. G. E. Lee** received an all-mains radio set, while **Mr. C. G. Ledder** and **Miss H. Edwards** were also presented with an all-electric wireless set and a small case of cutlery. Mr. Ledder and Mr. Lee joined the Electricity Department 18 years ago.

**Sir William Larke,** who represented the National Federation of Iron and Steel Manufacturers at Ottawa, is reported ill at his home at Sidcup as the result of a chill caught on the return journey.

**Mr. H. J. W. Haslett,** electrical engineer, has changed his address to 10, Gray's Inn Road, W.C. The telephone number is Holborn 5341.

**Mr. Arthur James Steed,** of the S.D.O. Department of the English Electric Co., Ltd., Stafford, who was recently married to Miss Gladys Mary Booth, who has also been on the company's staff, received from his colleagues a Westminster chiming clock, and Miss Booth was presented with an oak barometer and a case of cutlery.

**Mr. Charles H. Hilder,** a member of the staff of the Maidstone Corporation Electricity Department, was married on August 20th to Miss Constance Buck, of Maidstone.

**Mr. H. C. Siddeley,** M.I.E.E., representative of the B.E.A.M.A. in Buenos Aires, delivered a lecture on the work of Michael Faraday to the local Centre of the Institution of Electrical Engineers on June 10th. The lecture was illustrated by a film and lantern slides and several models of Faraday's apparatus were exhibited.

**Sir Andrew Duncan, Chairman of the Central Electricity Board, with Lady Duncan and their son, playing a round of miniature golf at Newquay, Cornwall**

**Mr. Frank Harris,** A.M.I.E.E., read a paper written by Mr. P. Dunsheath, O.B.E., on "Electric Cable Development and Research," before the Centre of British Engineering and Transport Institutions in Buenos Aires on July 15th. The paper was illustrated by a series of lantern slides lent by W. T. Henley's Telegraph Works Co., Ltd.

## Obituary

**Prof. Dr. Ing M. Jüllig.**—The death is reported from Vienna at the age of 78 years of Prof. Dr. Ing Max Jüllig, for many years head of the Vienna Technical High School and one of the pioneers of electricity and electrical engineering in Austria.

**Mr. S. J. Donner.**—The death is announced, at the age of fifty-four years, of Mr. Sidney Josiah Donner, who had for about twenty-five years been private secretary to Mr. H. N. Sporborg, director and chief engineer of the British Thomson-Houston Co., Ltd., Rugby. He joined the company in 1902.

**Mr. J. H. Collings.**—The funeral of the late Mr. J. H. Collings, whose death was reported in our last issue, took place at the City of London Cemetery, Manor Park, on Friday last. The company present included a large number of friends connected with the electrical industry. Sir Hugo Hirst, chairman and managing director of the General Electric Co., Ltd., in the service of which Mr. Collings had been engaged for more than forty years, was represented by Mr. H. Wynne Roberts, the sales director of the company, and the G.E.C. directorate was represented by Mr. M. J. Railing, joint managing director, and Mr. C. Wilson, manager of the Osram - G.E.C. Lamp Works.

[*Foz Studios.*

**The late Mr. J. H. Collings**

The various departments and personal colleagues of Mr. Collings included the following:—

Messrs. E. A. Joyce, F. G. Quance, T. Dyke, F. M. Chapman, W. W. Adams, W. F. A. Arnold, S. R. Bussey, A. J. Burbidge, E. H. Penwarden, W. B. Steggall, E. W. J. West, A. A. Hooper, A. R. Bolton, A. V. Cannon, L. A. Walker, S. H. Cross, W. Griggs, A. Griggs, E. G. Baker, F. W. Money, C. E. Haken, F. Holt, S. F. Thomas, F. C. Mayes, E. Silberman, C. A. Petty, S. Johnson, J. Dummelow, C. Shinton, A. Chapman, E. Andrews, F. C. Nicholls, T. Wilkinson, W. T. Cuff and T. E. Ritchie.

Wreaths and other floral tokens were sent by Sir Hugo and Lady Hirst, Mr. M. J. Railing, Mr. and Mrs. Leslie C. Gamage, the directors of the General Electric Co., Ltd., Mr. and Mrs. H. Wynne Roberts, Mr. S. D. White, Dr. A. H. Railing, Mr. M. Solomon, the directors and managers of The Reliance Telephone Co., Mr. Basil Davis, Mr. P. J. Sims and the Scottish area, Mr. F. Boyes and staff of the Birmingham district, Mr. F. R. Unwin and the staff of the G.E.C. Irish branches, Mr. and Mrs. G. H. Ide, Mr. and Mrs. F. G. Quance, Mr. J. H. Farthing and the Manchester office, Mr. F. Winstanley, the Head Office sales and counter staff, the G.E.C. Sick Fund Committee, Mr. W. E. Hobbs and the Cardiff district staff, Mr. W. Horsfall and the staff of the Newcastle Branch, the Fittings Dept., Magnet House, Mr. and Mrs. E. Wilson, branches of the G.E.C. overseas organisation, H.O. managers and staff, the staff of Magnet Works, Birmingham, the manager and staff of the Osram Dept., Mr. and Mrs. C. Wilson, Osram Lamp Works, and Mr. J. A. Phelp and staff of the Union Works, Wembley.

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**Wills.—Mr. William May,** chairman of the Reading Electric Supply Co., Ltd., and the Thames Valley Electric Supply Co., Ltd., and a director of the Greater London & Counties Trust, left unsettled estate valued at £197,083 (net personalty £196,617).

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### Public Lighting Conference

The ninth annual meeting and conference of the Association of Public Lighting Engineers will be held at Blackpool from September 5th to 8th, 1932. On Monday (September 5th) at 7.30 p.m. an exhibition of lamps and lighting appliances at the Imperial Hotel will be formally opened by the Mayor of Blackpool. On Tuesday at 10 a.m. the Conference will be opened by an official welcome, and Mr. Hardel Davies will deliver his presidential address. Councillor R. H. Minshall will present a paper on "The Administration of Public Lighting." Members will be entertained to luncheon at the Imperial Hotel by the Blackpool Corporation, and at 2.30 p.m. an address describing the exhibits will be delivered. On Wednesday, at 10 a.m., after the annual meeting, papers will be read on "The Planning of Installations to Conform with the British Standard Specification for Street Lighting," from both the gas and electrical aspects. The Association Luncheon will be held at 1 p.m., after which a series of papers dealing with the lighting of towns of small and medium sizes will be presented by Messrs. H. Collins (Colchester), I. H. Massey (Oldham), J. H. Clegg (Burnley), and J. P. Blackmore (Bombay).

# Financial Section

**New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares**

## New Companies Registered

**Utex Manufacturing Co., Ltd.**—Private company. Registered August 9th. Capital, £100 in £1 shares. Objects: To acquire the rights of sole owners of the letters patent No. 357199 of 1930, and letters No. 16212/32, 17271/32, and 15412/32, as and when granted, to acquire the business of the Utex Manufacturing Company, of 39, Holborn Viaduct, E.C.1, and to carry on the business of manufacturers of, agents for and dealers in all kinds of electrical, mechanical, engineering, radio goods and appliances, &c. The directors are: L. Zutshi and Eileen D. Zutshi, both of 27, Alexander Street, W.2. Registered office: Fearon House, 39, Holborn Viaduct, E.C.1.

**Mervyn Sound and Vision Co., Ltd.**—Private company. Registered August 20th. Capital £100 in £1 shares. Objects: To carry on the business of manufacturers and suppliers of and wholesale and retail dealers in all kinds of mechanical, electrical, wireless, television and gramophonic apparatus, &c. The permanent directors are: A. T. Painter, 46, Dunmow Road, Stratford, E.15; W. J. Nobbs, 52, Chandos Road, Cricklewood, N.W.2; and H. T. Leach, 161, Priory Road, Hornsey, N.8.

**Norman & Waghorn, Ltd.**—Private company. Registered August 18th. Capital £500 in £1 shares. Objects: To acquire the business of an electrical contractor and radio engineer carried on by J. A. Waghorn at 31, Queen's Avenue, Greenford. The first directors are: H. Norman, 55, Eccleston Road, Ealing, W.13; and J. A. Waghorn, 31, Queen's Avenue, Greenford. Registered office: 55, Eccleston Road, West Ealing, W.13.

**Tate & Co. (Ealing), Ltd.**—Private company. Registered August 18th. Capital £1,000 in £1 shares. Objects: To carry on the business of electrical, mechanical and hydraulic engineers, &c. The directors are: A. P. Bunt, 13, Mount Park Crescent, Ealing, W.5; and C. L. Bunt, 2, Ascott Avenue, Ealing, W.5.

**Greening Wire Co., Ltd.**—Private company. Registered August 18th. Capital £5,000 in £1 shares. Objects: To carry on the business of wire manufacturers, &c. The directors are: W. Yorke, 4, Bryanston Road, Birkenhead, and Engr. Rear-Admiral A. L. Picton, The Hydro, Hill Cliff, Appleton, Ches.; M. W. A. Peel Graham, 75, Victoria Street, S.W.1; and J. C. Kerr, 1, Fountain Road, Upper Norwood, S.E. Registered office: Britannia Works, Warrington, Lancs.

**Cooke's (Hull), Ltd.**—Private company. Registered August 18th. Capital £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless, electrical, telegraphic, telephonic and television apparatus and accessories, gramophones, &c. The directors are: S. D. Dickeson, 3, Arlington Avenue, Cottingham, E. Yorks; and E. P. Sharp, "Brierdene," George Street, Cottingham. Solicitor: R. W. Payne, Hanover House, Alfred Gelder Street, Hull.

**Conradty Products, Ltd.**—Private company. Registered August 17th. Capital £5,000 in £1 shares. Objects: To carry on, develop and turn to account the business and agency for the sale of the products of C. Conradty, of Nürnberg, Germany, and to carry on the business of dealers in and manufacturers of cinema and studio carbons, electrodes and anodes, welding carbons and plates, &c. The directors are: W. Littlejohn, 19, Fairmount Road, Brixton Hill, S.W.; and A. J. Clarke, Springfield, Wagon Road, Hadley Wood, Herts. Registered office: 101, Wardour Street, W.

**Fox Industrial, Ltd.**—Private company. Registered August 17th. Capital £3,000 in 2,000 "A" shares of £1 each and 20,000 "B" shares of 1s. each. Objects: To carry on business as electricians, electrical and mechanical engineers and contractors, manufacturers and suppliers of and dealers in radio and other electrical apparatus, &c. The subscribers are: M. E. Fox, 64, Holland Park Avenue, W.11; and J. E. Fraser, 6, Elgin Court, Elgin Avenue, W.9. Solicitors: Wetherfield, Baines & Baines, 6, New Burlington Street, W.1.

**Corfield-Sigg, Ltd.**—Private company. Registered August 13th. Capital £10,000 in 9,900 5 per cent. non-cumulative preference and 100 ordinary shares of £1 each. Objects: To carry on the business of manufacturers of and dealers in hardware, earthenware, iron and brass and other metals, mechanical, electrical and general engineers, makers of electrical apparatus, refrigerators, and ice-making plant, vacuum cleaners, &c. The subscribers are: J. Corfield, Woodstock, Sutton, Surrey; and S. D. Nicholls, "Shandon," 21, Selborne Road, Palmers Green, N.14. Registered office: 469, Holloway Road, N.7.

**Univolt Electric, Ltd.**—Private company. Registered August 16th. Capital £1,000 in £1 shares. Objects: To acquire inventions relating to motor mechanism for sound reproducing machines and electrical devices for operating the turntables of talking machines and record reproducing apparatus; to acquire the trade mark "Univolt," to adopt an agreement with Betto Electric Motors, Ltd., Rose Morris and Co., Ltd., and G. Shearls; and to carry on the business of electricians, radio and electrical engineers, &c. The subscribers are: A. A. Juviler, 111, Clifton Court, N.W.8; and G. Shearls, 165, Edgware Road, W.2. Registered office: Balfour House, 119-125, Finsbury Pavement, E.C.2.

**Harlie, Ltd.**—Private company. Registered August 16th. Capital £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless and electrical apparatus, &c., to acquire the trade mark "Harlie," and to enter into an assignment of the said trade mark and goodwill thereof by Harlie Bros. (Edmonton), Ltd. The directors are: C. Watson, 124, The Ridgeway, Chingford; and H. J. Camp, 17, Meadway, Bush Hill Park. Secretary: A. L. Peachey. Registered office: Cambridge Arterial Road, Enfield.

**Millbank Engineers, Ltd.**—Private company. Registered August 15th. Capital, £1,000 in £1 shares. Objects: To acquire the business of general engineers and manufacturers of air filters and other appliances for the ventilating and electrical trades now carried on at 25, Victoria Street, S.W.1, as "Millbank Engineers," and to carry on the business of motor, electrical and general engineers, &c. The permanent directors are: H. Eaton-Williams, 25, Victoria Street, S.W.1, and W. L. Hiscock, 15, Clarence Street, Staines.

## The Electrification of a Hacksaw Factory

FOR over fourteen years the manufacture in bulk of hacksaw blades has formed an important section of the activities of Messrs. Arthur Balfour & Co., Ltd., steel manufacturers, whose branch works including this department are situated on the outskirts of Sheffield. Originally such machinery as was used in the various processes of manufacture was belt driven from line shafting, which was in turn driven by two 24-h.p. electric motors.

**Tooth-setting machines (front row) driven by 1-h.p. motors and tooth-cutting machines (second row) with 5-h.p. motors**

The decision to equip a separate building facilitated the adoption of individual electric drive in the machine tool bay. The whole of the electrical equipment for the conversion was manufactured by the General Electric Co., Ltd. For driving machines twenty "Witton" motors are installed ranging in size from 1 to 25 h.p., the smaller of which are controlled by direct to line starters, and the larger by star-delta starters. In all cases the starters are push-button operated, so that each attendant has complete control of the operation for which he or she is responsible.

The blades are first sheared from sheets of special steel prepared by the firm in its own works, and passed to machines for tooth cutting. Subsequently in the next group of machines the teeth are set, the blades then being taken to machines for punching the holes by means of which the blade is secured to the frame. Finally further machines perform the operation of name stamping. There are, of course, many processes other than those in the machine shop, one important series of operations being necessary for the hardening and tempering of the blades.

**R.F.H., Ltd.**—Private company. Registered August 15th. Capital, £100 in £1 shares. Objects: To carry on business as engineers, contractors for the supply of heating installations, and electric lighting plants, &c. The directors are: R. F. Hearn and Grace E. Hearn, both of 12, The Ridgeway, Acton, W.3. Secretary: Grace E. Hearn. Registered office: 333, Gray's Inn Road, W.C.1.

**Amps, Ltd.**—Private company. Registered August 10th. Capital, £100 in £1 shares. Objects: To carry on the business of wireless and electrical engineers, &c. The directors are: W. A. Jupp, 21, Moorlands Road, Camberley, Surrey, and W. Harris, 133, Nightingale Road, Carshalton, Surrey. Registered office: 30, High Street, Camberley, Surrey.

# Returns of Electrical Companies

**International Hydro-Electric Development Syndicate, Ltd.**—Capital £10,000 in £1 shares. Return dated December 31st, 1932 (filed April 28th, 1932). 2,744 shares taken up. £2,744 paid. Mortgages and charges, nil.

**Northleach Electric Supply Co., Ltd.**—Capital £3,000 in £1 shares. Return dated June 8th, 1932. 2,195 shares taken up. £2,245 paid (including £50 paid on 100 forfeited shares). Mortgages and charges, nil.

**Allen West & Co., Ltd.**—Capital £700,000 in 400,000 ordinary and 300,000 preference shares of £1 each. Return dated March 1st, 1932. All shares taken up. £541,741 paid on 241,741 ordinary and 300,000 preference shares. £158,259 considered as paid on 158,259 ordinary shares. Mortgages and charges, £200,000.

**Sturge & Baker, Ltd.**—Capital £8,000 in £1 shares (1,500 preference and 6,500 ordinary). Return dated July 2nd, 1932. 1,500 preference and 5,896 ordinary shares taken up. £7,396 considered as paid. Mortgages and charges, nil.

**White & Mantle, Ltd.**—Capital £1,000 in £1 shares. Return dated December 31st, 1931 (filed April 9th, 1932). 551 shares taken up. £301 paid. £250 considered as paid. Mortgages and charges, nil.

**Truro Electricity Supply Co., Ltd.**—Capital £20,000 in £1 shares. Return dated May 5th, 1932. 15,000 shares taken up. £15,000 paid. Mortgages and charges, nil.

**Lithanode Co., Ltd.**—Issue on August 9th of £800 debentures, part of a series already registered.

**Park Radio & Engineering Co., Ltd.**—Capital £1,000 in £1 shares. Return dated December 21st, 1931 (filed May 24th, 1932). 502 shares taken up. £502 paid. Mortgages and charges, £500.

**Eltron (London), Ltd.**—Capital £1,000 in 750 "A" and 250 "B" shares of £1 each. Return dated December 31st, 1931 (filed May 12th, 1932). 750 "A" shares taken up. £210 paid. £540 calls unpaid. Mortgages and charges, nil.

**Electric Cables, Ltd.**—Capital £2,000 in £1 shares. Return dated December 31st, 1931 (filed April 13th, 1932). 1,000 shares taken up. £1,000 paid. Mortgages and charges, nil.

**Elsco Installations, Ltd.**—Capital £1,000 in £1 shares. Return dated February 12th, 1932. All shares taken up. £1,000 considered as paid. Mortgages and charges, nil.

**J. Gledson & Co., Ltd.**—Capital £15,000 in 5,000 6 per cent. cumulative preference and 10,000 ordinary shares of £1 each. Return dated June 18th, 1932. 4,500 preference and 7,500 ordinary shares taken up. £3,500 paid on 1,500 preference and 2,000 ordinary shares. £8,500 considered as paid on 3,000 preference and 5,500 ordinary shares. Mortgages and charges, nil.

**Shrosbery, Bakewell & Co., Ltd.**—Capital £3,000 in £1 shares. Return dated April 25th, 1932. 1,780 shares taken up. £1,780 paid. Mortgages and charges, £800.

**Wireless Relay Services, Ltd.**—Capital £3,000 in £1 shares. Return dated September 30th, 1931 (filed July 7th, 1932). 1,000 shares taken up. £1,000 paid. Mortgages and charges, nil.

**S. Kalisky (Aldgate), Ltd.**—Satisfaction on July 27th of memorandum of deposit of deeds dated February 8th, 1930, and registered February 17th, 1930. (According to the register of mortgages, the memorandum of deposit registered February 17th, 1930, originally secured all moneys due to bank.)

**Western Wireless & Electrical Co. (Salisbury), Ltd.**—J. R. Layton, Crown Chambers, Salisbury, was appointed receiver and manager on August 11th, under powers contained in debentures dated January 27th, 1927.

**Mayer & Co., Ltd.**—Particulars filed of £500 debentures authorised July 25th, charged on the company's undertaking and property, present and future, including uncalled capital (if any), the whole amount being now issued.

**Lithanode Co., Ltd.**—Satisfaction in full on May 9th, 1927, of debentures authorised December 31st, 1920, and registered January 18th, 1921. (According to the register of mortgages, the debentures registered January 18th, 1921, originally secured £1,000.) (Notice filed August 4th, 1932.)

# City Notes

**Commercial Investment Trust Corporation (New York).**—As this company specialises in hire-purchase finance in America, and as questions frequently arise here regarding the position of that class of business during periods of acute depression, we quote the following figures from the *Financial Times*' summary of the company's accounts:—The net volume of bills and accounts purchased during the first six months of this year at $171,584,776, compared with $195,761,594 for first half of 1931. The consolidated net profits available were $2,947,280, against $3,863,814. The report states that all determinable and known losses have been written off and reserves against possible future losses and unforeseen contingencies have been set up in accordance with the usual practice. While losses and repossessions continue to be somewhat greater than in normal years in relation to the volume of business, collections generally, it is stated, have been satisfactory. The amount of repossessed products in the possession of the corporation's subsidiaries on June 30th, at realisable values, was $148,480.

**Davis & Timmins, Ltd.**—We regret that we incorrectly stated in our last issue (page 269) that an interim dividend was to be paid on the ordinary shares of Davis & Timmins, Ltd. What we should have stated was that the directors recommended payment of the interest on the 6½ per cent. *preference* shares for the half-year ended June 30th, 1932.

**The A.E.G.**—The Sachsenwerk Licht und Kraft Aktiengesellschaft, on behalf of the A.E.G., has announced, for the information of those of its shareholders who do not take advantage of the releasing offer of the A.E.G., that payment of the dividend for 1931 will be made under deduction of 10 per cent. German income-tax forthwith against presentation of coupon No. 29.

**Companies to be Struck Off the Register.**—The names of the undermentioned companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—

Monolite Lamps, Ltd.
Radio Tri-Phone, Ltd.
Victor Portable Wireless Co., Ltd.

**The Quebec Power Co.** reports a gross revenue for the half-year ended June 30th of $2,111,189, as compared with $2,399,649 in the first half of 1931. After deducting operating expenses, interest, &c., the net surplus available for shareholders was $362,688. The surplus carried forward from 1931 was $313,779, subject to deduction for income-tax.

**The Associated Gas and Electric System** reports a total gross revenue of $102,323,286 for the year ended June 30th last, against $105,676,968 in 1930-31. The net operating revenue fell from $49,213,885 to $45,671,656, and the operating income from $41,920,648 to $35,512,013.

**Southern Brazil Electric.**—As a result of a resolution passed at a meeting of 6½ per cent. mortgage debenture holders on August 11th, it has been decided to pay the half-yearly interest due on July 1st at the reduced rate of 1½ per cent.

**Waste Heat & Gas Electrical Generating Stations** announce an interim dividend of 2½ per cent. (same) on the ordinary shares.

**Leatherhead Gas & Lighting** has declared a dividend at the rate of 5 per cent. per annum, less tax, for the half-year on its ordinary shares (same).

**The Clyde Valley Electrical Power Co.** has announced an interim dividend on the ordinary capital of 3 per cent. less tax (same).

**The Newcastle-upon-Tyne Electric Supply Co., Ltd.,** has declared an interim dividend of 2½ per cent. on the ordinary shares (same).

**Pinchin, Johnson & Co.**—An interim dividend of 7½ per cent. (against 10 per cent.) has been declared on the ordinary shares.

# Stocks and Shares

TUESDAY EVENING.

THE tendency in Stock Exchange markets continues cheerful, and, in spite of the holiday influences, business in a good many of the markets is far from slack. In fact, the present month of August has disproved the conventional theory that business in the Stock Exchange comes to something like a full-stop during the height of the holiday season. Notwithstanding the recent heat wave, the present month has brought a good deal of grist to Stock Exchange mills, even though the rush of business caused by the War Loan conversion is now virtually over.

## The Ban on New Issues

The Government is being urged from all sides to lift the ban laid upon new issues of stocks and shares. It is well-known that when this restraint is removed, there will be a rush of candidates for capital. Anticipating this, some of the larger investors are keeping back money for participation in new issues when these begin to appear. This ban on new issues has been, throughout, of a voluntary, not a compulsory, character, imposed at the desire of the Government, for no stated period of time, with a view to removing any possible hindrance from the path of the conversion scheme's success. The continuance of its operation, costly as it is to a good many interests, is evidence of the willingness that everybody has shown in the endeavour to further the conversion of the five per cent. War Loan.

## Electricity Supply

The 4½ per cent. debenture scrip of the Central Electricity Authority, which a week ago stood at 7 premium, after being down to 4 premium a few days earlier, is now 5½, the price having moved in a manner more suggestive of that of some speculative mining share than that of a sober investment. The other gilt-edged issues have been following the lead set by the price of the five per cent. War Loan assented stock, and this has leaned to the dull side, owing to sales by people disappointed at the failure of the price to go ahead after the first month of the operation had been concluded. The prior-charge stocks of the Home Railway market continue, however, to be well held at their previously high levels. The ordinary stocks of the Home Electricity supply companies have suffered not at all. The list is one of unbroken strength. South Londons are the only shares in the catalogue to show alteration, and, in their case, a rise of 1s. has taken the price to 33s., which is now the highest of any of the ordinary shares in this group. Scottish Power ordinary and Midland Counties ordinary have risen to the common price of 32s. 6d.

## Home Railway Stock

The substantial gains secured last week by Central London non-assented issues have been retained, and the prices of the other members of the group are unaltered on the week. The eagerly expected report of the Salter Committee on rail and road transport aroused a chorus of commendation, but the London General Omnibus Company and its assented group are far from pleased with some of the proposals put forward. With reference to taxation, for example, the L.G.O.C. declares that if the suggested increase were to be put into force, this would involve a drastic increase in omnibus fares. The company states that the standard 60-seater double-deck London omnibus now pays, roundly, £370 per annum in taxation. The Salter report proposes that this should be advanced to £555. The company estimates that this would mean an addition of 2¼ million pounds per annum to the expenses of the omnibuses, and that it represents a charge of 3d. per mile.

The London Midland & Scottish Railway is to bring into operation the newly electrified lines between Barking and Upminster on Monday, September 12th. Technical tests are now being carried out.

## Cables and Wireless

Renewed strength in Cables & Wireless stocks followed upon the substantial price improvements secured last week. The three stocks show rises, the preference being 2 up at 67½. The unexpectedly successful termination of the Ottawa Conference—unexpected because, in advance, there was a good deal of mild scepticism in the City as to the likely outcome of the Conference—served to emphasise the more hopeful feeling that had been in evidence with reference to the business of cable communication. This somewhat vague impression was supplemented by talk of a possible early announcement as to rapprochement between the Combine and the Post Office—talk which has been heard for weeks past, and which will no doubt one of these days materialise into something concrete. The Ottawa Conference produced results more definite than it had been expected to do, and for this reason its culmination was held as a bull factor for markets round the House. Marconi Marines are, however, dull at 29s. 6d. Anglo-American ordinary stock strengthened to 62½. The firmness of debenture stocks in this particular section remains unabated. It is noted with interest that the Cunard Company has made an agreement with the International Marine Radio Company, London, under which the latter will take over and operate the wireless telegraph services on the Cunard passenger steamers, instead of the Cunard Company doing this for itself.

## Movements in Dollar Stocks

The issue of the Ottawa Conference, while it had comparatively little effect upon stocks and shares of British companies, evidently impressed the American mind with a greater degree of importance, for the immediate effect was the receipt in London of a considerable number of buying orders for Canadian securities, coupled with others that related to, more particularly, American companies. Consolidated Gas & Electric of Baltimore advanced to 81½. American Telephone & Telegraphs rose 10 to 167½, Power Corporation of Canada advanced to 12, Shawinigans to 21. Montreal Light & Power remained at 43, International Telephone & Telegraph stock at 17 is again better, on top of its previous week's substantial rise. Hydro-Electrics went back from 9¼ to 8¼ before rallying to 9. The preferred shares, after their advance, reacted to 6½. British Columbia Power A spurted to 33½; the B rose to 8½.

In the Brazilian group reaction occurred in the shares of the Brazilian Traction Light & Power Company, on the delay in the publication of the July earnings. A rise of 7 points in Mexico Tramway 5 per cent. bonds lifted the price to 29½, the shares being quoted a little better at 8½, which latter price looks anomalous, in view of the company's 6 per cent. 50-year mortgage bonds standing at 6½. Mexican Light & Power first bonds are unchanged at 54½, the 5 per cent. seconds being rather better at 40, and changing hands up to 42. Western Union common shares rose to 50.

## Manufacturing and Equipment

Ever-Ready shares are a good market at 25s. 9d., showing a gain of 1/16 on the week. In support of the rise, the buyers argue that the yield on the money is by no means bad, and that, considering the progress which the company is making, the improvement is overdue. The opening of the Radio Exhibition at Olympia serves to advertise the claims upon investment attention of shares in a number of the companies occupied with radio work, and the industrial market, speaking generally, is just now popular with the speculative investor. Henley's preference at 4⅞, and Enfield ordinary at 3⅞, are both ex dividend. Allowing for the deductions, the prices show no particular change. Ferranti preference have gone back to 23s. 9d. British Aluminiums are better at 24s. 6d. Other shares in the group are steady. Telephone Manufacturing strengthened to 3s. 9d. The iron and steel market has been assisted to some extent by the agreements reached at Ottawa. Babcock & Wilcox advanced to 44s. 6d. Vickers are a little lower at 6s. 6d. Amongst the gramophone shares, Electrical and Musical Industries continue to be the centre of a good deal of speculation, New York having taken them in hand vigorously. The price is revolving between 15s. 6d. and 16s. Amongst miscellaneous movements, a rise of 5 points in Perak River Hydro-Electric participating debenture put up the price to 27½. A rather better tendency prevails in the market for rubber shares.

# Share List of Electrical Companies

| | Nom. | Approx. Dividend. 1930. | 1931. | Price. Aug. 23. | Rise. or Fall. | Yield. p.c. £ s. d. |
|---|---|---|---|---|---|---|
| **HOME ELECTRICITY COMPANIES.** | | | | | | |
| Bournemouth and Poole | 1 | 15 | 15 | 70/-xd. | — | 4 5 9 |
| Brompton Ordinary | 1 | 8½ | 8½ | 32/- | — | 4 7 6 |
| Central Electricity 4½% Deb. | Stock | 4½ | 4½ | 102½ | — | 4 7 10 |
| Charing Cross Ordinary | 1 | 8½ | 8½ | 32/- | — | 4 7 6 |
| Chelsea | 1 | 8½ | 8½ | 32/- | — | 4 7 6 |
| City of London | 1 | 10 | 10 | 42/6 | — | 4 14 1 |
| Clyde Valley | 1 | 8 | 7 | 30/- | — | 4 13 4 |
| County of London | 1 | 11 | 10½ | 47/6 | — | 4 8 5 |
| Edmundsons' 7% Pref. | 1 | 7 | 7 | 29/- | — | 4 16 7 |
| Elec. Dis. Yorkshire | 1 | 9 | 9 | 38/3 | — | 4 14 1 |
| Elec. Supply Corporation | 1 | 11 | 11 | 52/6 | — | 4 3 10 |
| Kensington Ordinary | 1 | 8 | 8 | 33/- | — | 4 4 10 |
| Lancs. Light and Power | 1 | 6½ | 7 | 28/9 | — | 4 17 5 |
| London & Home Counties 4½% Deb. Stock | | 4½ | 4½ | 106½ | — | 4 4 6 |
| London Electric | 1 | 9 | 9 | 32/6 | — | 4 6 2 |
| Metropolitan | 1 | 10 | 10 | 45/- | — | 4 9 0 |
| Midland Counties | 1 | 7 | 7 | 32/6 | +⅛ | 4 6 2 |
| Mid. Elec. Power | 1 | 8 | 8 | 33/3 | — | 4 16 9 |
| Newcastle-on-Tyne Ordinary | 1 | 6 | 6 | 25/- | — | 4 16 0 |
| Do. 7% Pref. | 1 | 7 | 7 | 31/- | — | 4 10 4 |
| Northampton | 1 | 10 | 10 | 45/- | — | 4 9 0 |
| Notting Hill 6% Pref. | 10 | 6 | 6 | 12½ | — | 4 16 0 |
| North Met. Elec. 6% Pref. | 1 | 6 | 6 | 28/6 | — | 4 4 3 |
| St. James' and Pall Mall | 1 | 8 | 8 | 32/- | — | 4 7 6 |
| Scottish Power | 1 | 8 | — | 32/6 | +⅛ | 4 18 6 |
| South London | 1 | 8½ | 8½ | 33/- | +1/- | 4 10 0 |
| Urban Ordinary | 1 | 7 | — | 28/9 | — | 4 17 5 |
| Westminster Ordinary | 1 | 8½ | 8½ | 32/6xd. | — | 4 6 2 |
| Whitehall Elec. Invst. 7½% Pref. | 1 | 7½ | 7½ | 16/3 | — | 9 4 8 |
| Yorkshire Elec. | 1 | 8 | 8 | 37/- | — | 4 6 6 |
| **HOME RAILS.** | | | | | | |
| Central London Ord. Assented | Stock | 4 | 4 | 81¼xd. | — | 4 18 2 |
| Metropolitan | ,, | 3½ | 2½ | 69 | — | 4 3 4 |
| Do. District | ,, | 5 | 4½ | 58½ | — | 7 13 10 |
| Underground Electric | 1 | 8 | 7 | 18/- | — | 7 15 7 |
| **TELEGRAPH AND TELEPHONES.** | | | | | | |
| American Tel. & Tel. | $100 | 9 | 9 | 167½ | +10 | 5 7 6 |
| Anglo-Am. Tel. Pref. | Stock | 6 | 6 | 102½ | — | 5 17 1 |
| Do. Def. | ,, | 1½ | 1½ | 24 | — | 6 5 0 |
| Cables & Wireless 5½% Pref. | ,, | 5½ | 2¾ | 67½ | +2 | 4 1 6 |
| Do. A 7½% Ord. | ,, | — | Nil | 24 | +1 | — |
| Do. B Ord. | ,, | — | Nil | 10 | +½ | — |
| Globe Tel. and T. Ord. | 10 | 8½ | Nil | 8½ | — | — |
| Do. do. Pref. | 10 | 6 | 6 | 10½ | — | 5 14 3 |
| Great Northern Tel. | 10 | 20 | 20 | 25½ | — | 7 17 0 |
| Marconi-Marine | 1 | 15 | 10 | 29/6 | −6d. | 6 15 7 |
| Oriental Telephone Ord. | 1 | 12 | 12 | 2½ | — | *4 16 0 |
| **HOME AND FOREIGN TRAMS, ETC.** | | | | | | |
| Anglo-Arg. Trams First Pref. | 5 | — | — | 3/9 | — | — |
| Do. do. 2nd Pref. | 5 | — | — | 3/9 | — | — |
| Do. do. 5% Deb. | Stock | — | — | 7 | — | — |
| British Electric Traction Def. Ord. | ,, | 5 | 5 | 300 | — | — |
| Do. do. Pref. Ord. | ,, | 8 | 8 | 133½ | — | 5 19 10 |
| Brazil Traction | 100 | — | — | 12¾ | −¼ | — |
| Brit. Columbia Elec. Rly. Pce. | Stock | 5 | 5 | 99½ | — | 5 0 6 |
| London & Sub. Trac. 5% Pref. | 1 | Nil | Nil | 9/6 | — | — |
| London United Tram Deb. | Stock | 4 | 4 | 62½ | — | 6 8 0 |
| Mexico Trams, 5% Bonds | — | 5 | 5 | 29½ | +7 | 16 19 0 |
| Mexican Light Common | 100 | Nil | Nil | 12½ | −2 | — |
| Do. 7% Pref. | 100 | 7 | 7 | 15 | — | — |
| Do. 1st Bonds | — | 5 | 5 | 54½xd. | — | 9 2 0 |
| Victoria Falls Ord. | 1 | 15 | 15 | 68/9 | — | 4 7 3 |
| Yorkshire (West Riding) | 1 | Nil | Nil | 5/- | — | — |
| **MANUFACTURING COMPANIES.** | | | | | | |
| Assoc. Elec. Ord. | 1 | 6 | 4 | 18/9 | — | 4 5 4 |
| Do. Pref. | 1 | 8 | 8 | 31/3 | — | 5 2 5 |
| Babcock & Wilcox | 1 | 15 | 14 | 44/6 | +9d. | 6 5 10 |
| British Aluminium Ord. | 1 | 10 | 5 | 24/6 | +9d. | 4 1 8 |
| British Insulated Ord. | 1 | 15 | 15 | 62/6 | — | 4 16 0 |
| Brush Ord. | Stock | 5 | Nil | 40 | — | — |
| Callender's | 1 | 15 | 15 | 57/6 | — | 5 4 4 |
| Do. 6½% Pref. | 1 | 6½ | 6½ | 27/6 | — | 4 14 6 |
| Crompton Parkinson Ord. | 5/- | 30 | 24 | 18/9 | — | 6 7 8 |
| Do. 8% Pref. | 1 | 8 | 8 | 30/- | — | 5 6 8 |
| Edison-Swan 1st. Pref. | 1 | 7½ | 7½ | 23/3 | — | 6 9 4 |
| Do. 5% Deb. | Stock | 5 | 5 | 100 | — | 5 0 0 |
| Electric Construction | 1 | Nil | Nil | 7/6 | — | — |
| Enfield Cable Ord. | 1 | 25 | 25 | 3¾xd. | — | 6 8 0 |
| English Electric | 1 | Nil | Nil | 10/9 | — | — |
| Do. do. Pref. | 1 | Nil | Nil | 12/6 | — | — |
| Ever Ready | 5/- | 35 | 35 | 25/9 | +⅛ | 6 16 9 |
| Ferranti Pref. | 1 | 7 | 7 | 23/9 | −9d. | 5 18 0 |
| G.E.C. Pref. | 1 | 6½ | 6½ | 28/- | — | 4 12 10 |
| Do. ord. | 1 | 10 | 8 | 42/6 | — | 3 15 4 |
| Henley's | 1 | 30 | 30 | 5⅛ | — | 5 1 1 |
| Do. 4½ Pref. | 5 | 4½ | 4½ | 4¾xd. | — | 4 12 4 |
| India-Rubber | 1 | Nil | Nil | 3/9 | — | — |
| Johnson & Phillips | 1 | 10 | 5 | ¾ | — | 5 14 3 |
| Siemens Ord. | 1 | 7½ | 7½ | 23/3 | — | 6 9 0 |
| Telegraph Construction | 12 | Nil | Nil | 10½ | — | — |

* Dividends paid free of Income Tax.

# Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

**1931**

5967. "Circuit for the operation of railway points and signals." Vereinigte Eisenbahn-Signal-Werke Akt.-Ges. March 28th, 1930. (377718.)

6553. "Alternating current motors." Sangamo Electric Co. January 19th, 1931. (377696.)

9405. "Gaseous conduction electric lamps." British Thomson-Houston Co., Ltd. March 31st, 1930. (377726.)

11474. "Electric motors." General Electric Co., Ltd., and H. C. E. Jacoby. April 17th, 1931. (377698.)

11677. "Electric power supply systems." General Electric Co., Ltd., and B. Davis. April 20th, 1931. (Cognate application 31981/31.) (377671.)

11944. "High-tension ignition magnetos." J. Bernard. May 19th, 1930. (377728.)

11971. "Train control systems." Associated Telephone and Telegraph Co., and A. E. Hudd. April 22nd, 1931. (Cognate application 19143/31 and 641/32.) (Addition to 351071.) (377702.)

11982. "Coils used in dual-range band-pass filters for radio receivers." G. H. Moody and H. H. Abrahams. April 22nd, 1931. (377,703. )

12121. "Electric circuit breakers." British Thomson-Houston Co., Ltd. April 23rd, 1930. (377707.)

12386. "Methods of and apparatus for calibrating and adjusting electrically operated light valves, such as are used for the photographic recording of sound." Electrical Research Products Inc. April 30th, 1930. (377,686.)

12391. "Manufacture of flexible electrical insulating material." D. Traill, and Imperial Chemical Industries, Ltd. April 27th, 1931. (377688.)

12401. "Scanning discs or the like for use in television and other picture transmission systems, and methods of producing same." H. Baron (L. L. de Kramolin). April 27th, 1931. (377709.)

12425. "Valve receivers for wireless telephony." Ideal Werke Akt.-Ges. für Drahtlose Telegraphie. April 25th, 1930. (377711.)

12434. "Electric discharge tubes." Boonton Research Corporation. June 26th, 1930. (377692.)

12649. "Systems of electrical regulation." British Thomson-Houston Co., Ltd. April 29th, 1930. (377738.)

13099. "Electric switchgear." A. Reyrolle & Co., Ltd., H. W. Clothier, and E. Waterhouse. May 4th, 1931. (377750.)

13118. "Loudspeakers." K. A. Heyum, and Magnavox (Great Britain), Ltd. May 4th, 1931. (377752.)

13127. "Radio loudspeakers and the like sound reproducing apparatus." W. A. Brockway. May 4th, 1931. (377755.)

13145. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and L. Griffiths. May 4th, 1931. (377757.)

13418. "Radio signalling systems." P. P. Eckersley. May 6th, 1931. (377763.)

14915. "Telegraphic intercommunication systems." Siemens and Halske Akt.-Ges. July 5th, 1930. (377772.)

21857. "Time lag devices for use with electric switches." A. B. Mudie. July 31st, 1931. (377816.)

24755. "Protection of d.c. networks." Union d'Electricité. September 26th, 1930. (377829.)

25281. "Loudspeaker movements." C. F. Burton and H. Burton. September 9th, 1931. (377833.)

26150. "Remote control device for electric motors." R. Trubert. September 24th, 1930. (377837.)

26552. "Sound amplifiers." H. Kanders. September 30th, 1930. (Addition to 228905.) (377839.)

26966. "Means for operating a plurality of electric switches, by a single operating member." Arrow-Hart & Hegeman Electric Co. October 30th, 1930. (377842.)

26783. "X-ray apparatus." British Thomson-Houston Co., Ltd. Sept. 27th, 1930. (377496.)

28143. Electric resistance tubes and particularly variator tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Oct. 16th, 1930. (377503.)

29161. "High tension condensers." Siemens-Schuckertwerke Akt.-Ges. March 11th, 1931. (377035.)

29276. "Sound amplifying system." H. G. C. Fairweather (Hooven Automatic Typewriter Corporation). Oct. 21st, 1931. (377511.)

29558. "Gasfilled discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 31st, 1930. (377041.)

30022. "Direct current drives for lifting gears and the like." International General Electric Co., Inc. Oct. 30th, 1930. (377516.)

30353. "High-tension electrical condensers." W. W. Triggs (Meirowsky & Co. Akt.-Ges.). November 2nd, 1931. (377859.)

30366. "Electric battery lamps." L. N. Reddie, J. Neu, and J. Neuburger. Nov. 2nd, 1931. (377520.)

30414. "Television and like apparatus." T. W. Collier and Baird Television, Ltd. November 3rd, 1931. (377045.)

30569. "Electric motors." G. Stockert and R. Stockert. November 4th, 1931. (377047.)

30675. "Installation of underground electric cables for power transmission." Naamlooze Vennootschap Handelmaatschappij Cablon. (Cablon Corp.). November 25th, 1930. (Addition to 366673.) (377049.)

30966. "Electric fluid heating apparatus." R. A. Carleton. Aug. 7th, 1931. (377528.)

31330. "Boxes for electric switches, fuses, or like electrical accessories." A. Orning and U. Orning. Nov. 12th, 1931. (377531.)

31513. "Short wave oscillatory systems." Marconi's Wireless Telegraph Co., Ltd. November 14th, 1930. (377535.)

31987. "Safety devices for elevators." Westinghouse Electric and Manufacturing Co. November 26th, 1930. (377059.)

32134. "Electrical amplifier discharge valves." Telefunken Ges. für Drahtlose Telegraphie. November 21st, 1930. (377540.)

32451. "Synchronous motors." Siemens and Halske Akt.-Ges. November 27th, 1930. (377066.)

32619. "Wireless aerial." B. H. Upton. November 25th, 1931. (377544.)

32737. "Kerr cells." Gramophone Co., Ltd., and W. D. Wright. November 25th, 1931. (377871.)

32936. "Thermionic valve oscillator systems." Wired Radio Inc. July 3rd, 1931. (377067.)

33674. "Control by wireless of unmanned signalling stations." J. Pintsch Akt.-Ges. December 4th, 1931. (Addition to 343924.) (377876.)

33772. "Interrupters for electric ignition apparatus of internal-combustion engines." R. Bosch Akt. Ges. December 19th, 1930. (377072.)

33983. "Prepayment gas and electricity meters." G. P. Mitchell. December 8th, 1931. (377549.)

34221. "Induction magneto-electric machines." R. Bosch Akt.-Ges. March 24th, 1931. (377551.)

34639. "Incandescent electric lamps." Westinghouse Lamp Co. December 13th, 1930. (377554.)

34662. "Aerial systems." Telefunken Ges. für Drahtlose Telegraphie. December 12th, 1930. (377078.)

35744. "Thermionic valve circuit arrangements." Soc. Francaise Radio-Electrique. December 24th, 1930. (377558.)

**1932**

872. "Electrically lighted floor cleaner." W. Fairweather (Singer Manufacturing Co.). January 12th, 1932. (377892.)

2396. "Apparatus for the generation of electrical energy." Dr. V. Leisser. January 28th, 1931. (377901.)

2563. "Interlocking switch-plugs." C. H. Parsons, Ltd., and G. B. Handley. January 28th, 1932. (377902.)

5911. "Frequency changing systems." British Thomson-Houston Co., Ltd. February 28th, 1931. (377913.)

6702. "Submarine communication cable plant with high attenuation and repeaters." Siemens & Halske Akt.-Ges. March 5th, 1931. (377918.)

8695. "Electric condensers." International General Electric Co., Inc. March 23rd, 1931. (377922.)

8838. "Apparatus for providing energy for electric fuses for projectiles and the like." Rheinische Metallwaaren-and Maschinen-Fabrik. April 27th, 1931. (377925.)

11363. "Electrical resistances." Steatit-Magnesia Akt.-Ges. April 21st, 1931. (377929.)

16826. "Sparking plugs for internal combustion engines." Siemens & Halske Akt.-Ges. May 14th, 1932. (377935.)

17810. "Train control systems." Associated Telephone and Telegraph Co., Ltd., and A. E. Hudd. April 22nd, 1931. (Cognate application 17811/32.) (Divided application on 377702.) (377673.)

# Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 17th:—

Rite-A-Lite. No. 532420. Class 8. Electrically illuminated advertising signs.—Utilities Specialty, Ltd., Dorland House, 14, Regent Street, S.W.

Thermium. No. 533495. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Ready Radio, Ltd., Eastnor House, Blackheath, S.E.3.

Ultra Radio; Radio's Richest Voice (lettering and design). No. 533105. Class 8. Wireless telephonic and telegraphic apparatus and parts thereof, telephones, loud speakers, condensers, transformers, &c.—Ultra Electric, Ltd., Ultra Works, Erskine Street, N.W.3.

Adventurer. No. 533534. All goods in Class 8.—The Peto-Scott Co., Ltd., 77, City Road, E.C.1.

Pyschon Radio (lettering and design). No. 533271. Class 8. Wireless telephonic and telegraphic instruments, electric accumulators and batteries (not for medical purposes), induction coils and electrical resistances.—Pyschon, Ltd., 4, Westminster Palace Gardens, Artillery Row, Westminster, S.W.1.

Edac. No. 528912. Class 13. Electric irons, kettles, coffee percolators, milk warmers, bed warmers, electrically heated curling tons, and electric water boiling utensils.—No. 528919. Class 13. Electric toasting stoves, car heaters, warming plates, towel rails and wash boilers.—Charles H. Twigg, trading as the Electric Domestic Appliance Co., 6, Kingstanding Road, Perry Barr, Birmingham.

## Summer School Cookery

The third Board of Education summer school, which was held at the National Society's Training College of Domestic Subjects from August 3rd to 13th, was again organised by the Electrical Association for Women. At the special request of the Board of Education the school this year had a particular bias towards electrical cookery, and was assisted by the loan of cookers, laundry equipment, and other domestic appliances; samples of cables and flexes were also supplied through the Cable Makers' Association. The large number of cookers available made it possible for each cooker to be used by only two or three students, thus making the cookery work both pleasant and of greater practical value.

A special lighting session, arranged by Mr. W. J. Jones, was held at the E.L.M.A. Lighting Service Bureau; lectures and demonstrations were given on lighting for the school and the home, and on class instruction in lighting.

A visit was paid to the electrically equipped bungalow of the General Electric Co., Ltd., in Kingsway, and the students, who were all teachers, also visited the new showrooms of the Brompton and Kensington Electric Supply Co., Ltd.

Miss Anna Holm, of the Newcastle-upon-Tyne Electric Supply Co., Ltd., lectured on both the domestic and electrical sides.

# New Work for Contractors

## Particulars of new works and building schemes for the use of electrical installation contractors and traders

*Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.*

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**Aberdeen.**—Barracks for the Gordon Highlanders (£150,000); War Office.

**Alkham** (KENT).—Pumping station for the Folkestone Water Co.; secretary.

**Ashby-de-la-Zouch.**—Houses (42); R.D.C. surveyor.

**Aylesbury** (BUCKS).—Houses (100); R.D.C. surveyor. Extensions, Poor Law Institution (£9,000), for the P.A.C.; clerk.

**Ayr.**—Showrooms, Main Street, for P. Macluskie; Mr. McClelland, architect, Cathcart Street.

**Bath.**—Central stores, with electrical and heating work, for the Co-operative Society; J. Long & Sons, builders.

**Birmingham.**—Factory, Wolverhampton Road, near Blackheath; Maddocks & Walfords, builders, Tyburn Road.

**Bournemouth.**—Development of Sunnyhill Road and Sandy Lane; W. Pickford. Hotel and flats, Bath Road; L. Bell. Library extension, Winton (£1,596); F. Hoare & Sons. Pavilion, Meyrick Park (£2,850); Hawkins Bros.

**Bradford.**—Extensions to premises of Hepworth & Grandage, Ltd., St. John's Works.

**Brighouse** (YORKS).—Extensions, Rastrick Common School, for the Borough E.C.; Sharp & Waller, architects, 32, Bradford Road.

**Brighton.**—Houses (200), Bevendean Estate; Braybons, Ltd. Houses (24), Whitehawk Estate; E. B. Hayward. Bungalows and 113 houses, Ladies Mile Estate, Patcham; G. Ferguson and Son. Business premises and flats, North Road and Gardner Street; J. Salbstein. Cinema, Gloucester Place (£60,000), for Sound Theatres Construction Syndicate, Ltd.; Major C. A. Bell, consulting electrician. Coach station, hotel, &c., Stoll site; Mr. Brazier, Worthing.

**Burbage** (LEICESTERSHIRE).—Alterations to business premises, Church Street; J. Paul & Sons, Ltd., builders, Homeland, Salem Road.

**Burnley.**—Estate development, Barden Lane; Captain T. A. Tatton. Rehousing scheme; borough engineer.

**Buxton.**—Cinema at the rear of Crescent Hotel, for W. A. Milton; G. Temperley & Son, architects, Bradford Buildings, Bolton.

**Cambridge.**—University library; Sir G. G. Scott, architect; Rattee & Kett, Ltd., builders.

**Cannock.**—Bank, Market Square, for Midland Bank, Ltd.

**Cheadle** (STAFFS).—Houses (20), Spring Bank; R.D.C. surveyor.

**Colchester.**—Houses (100): H. Collins, borough engineer. Improvements to Greenstead School; managers.

**Coseley** (STAFFS).—Houses (60) for the U.D.C.; A. E. Greensill, builder.

**Cumnock** (AYRSHIRE).—Houses (56); burgh surveyor.

**Derby.**—Bazaar premises for Marks & Spencer, Ltd.

**Doncaster.**—Buildings at St. Catherine's, for the South Yorks Joint Board for the Mentally Defectives; V. Turner, architect to the Board, Municipal Offices, Rotherham. Re-erection of bakery, Market Place and Baxtergate, for J. S. Driver.

**Dundee.**—Reconstruction of the Police Headquarters; city architect.

**Durham.**—Extensions to Delves Lane School, Consett (£3,500); F. Willey, architect, 34, Old Elvert.

**Eccles.**—Alterations to Broadway Cinema; J. Gomersall, architect.

**Edinburgh.**—Extension of Stenhouse School; city architect.

**Enfield.**—Development of Grange Park Estate; Marshall Estates, Ltd. Factory for J. Yeomans, Enfield Highway; L. B. Smith.

**Evesham.**—Houses (44); R.D.C. surveyor.

**Exeter.**—Development of estate at St. James's Priory; Staverton Builders, Ltd.

**Fenton** (STAFFS).—Estate development, Grove Road, for J. B. Thompson; Mr. Walton, architect.

**Gateshead-on-Tyne.**—Rebuilding of Wylam Hotel; W. Hall, Derwentwater Road.

**Glasgow.**—Houses, Polmadie (144) and Tollcross (36); housing director and trade contractor. Garage extension, Govan Works (£6,810); P. Thaw. School, Carnwadric (£3,122); J. & C. Fleming.

**Halesowen.**—Council chamber and library (£8,885) for the U.D.C.; J. M. Tate, builder, Cradley.

**Hamilton.**—Houses (198), Udston; A. Cullen, architect, 88, Cadzow Street.

**Hanley.**—Shops (30), with arcades, for C. McIlroy.

**Hastings.**—Block of flats, Boscobel Road, St. Leonards-on-Sea; P. H. Oxley, architect, 19, Havelock Road.

**Hebburn-on-Tyne.**—Houses (122); T. A. Page & Son, 67, King Street, South Shields.

**Hemel Hempstead.**—Dairy, Flamstead, for Lady Ludlow.

**Hertfordshire.**—School, St. Stephen, Watford, for the E.C.; E. Longmore, clerk, Hertford.

**Irish Free State** (DUBLIN).—Flats (290), Hanover Street; city engineer. (NEWCASTLE WEST).—Houses (35); secretary to the Town Commissioners. (CASTLEBAR, BALLINA, AND WESTPORT, CO. MAYO).—Technical schools, for the Vocational E.C.; R. M. Butler, architect, 82, Merrion Square, Dublin.

**Kent.**—Two schools, Nonington, Aylesham, and enlargement of County School for Girls, Dover; county architect, Maidstone.

**Leybourne** (KENT).—Admission hospital, &c., Grange Hospital Estate; county architect, Maidstone.

**Lightwood** (STAFFS).—Development of site at the corner of Bog Lane and Stone Road; Beckett & Bloore.

**Liversedge.**—Houses (50), for Spenborough U.D.C.; A. Rothera, surveyor, Church Street, Cleckheaton.

**Lochgelly** (FIFE).—Re-erection of garage (£5,000), for Simpson and Forrester, Ltd., Bank Street.

**London.**—(CROFTON PARK).—Houses, Brockley Road Estate; Messrs. Wates, Ltd., 668, High Road, Streatham, S.W. (ILFORD).—Conversion of shops, Horns Road; R. S. Andrews. (SOUTHALL).—Houses, Greenland Crescent (66) and Derley Road (127); General Housing Co. Shops (13) and flats, Allenby Road, and houses (56), Sunnycroft Road; G. Wimpey & Co., Ltd.

**Maldon** (ESSEX).—Houses (50), Park Drive Estate; borough engineer, Municipal Offices.

**Manchester.**—Council schools, Benchill & Blackley; city architect.

**Middlesex.**—Additions to Quainton Hall School, Hindes Road, Wealdstone; E. Percival.

**Middleton Junction** (MANCHESTER).—Building, Greengate Street, for Middleton Junction Conservative Club; H. Rothwell, architect, 222, Manchester Road;

**Morecambe.**—Estate development, Osborne Road; Harrison and Moore.

**Nantwich** (CHESHIRE).—Houses (62); U.D.C. surveyor.

**Newcastle-on-Tyne.**—School, Cowgate (800 places); F. H. Holford, architect, Town Hall. Business premises for Messrs. Sinton & Baxter; W. Hall, Derwentwater Road, Gateshead.

**Northern Ireland** (CLOGHER, CO. TYRONE).—Public elementary school for the Rev. James O'Daly; J. Donnelly, architect, Enniskillen, Co. Fermanagh. (Returnable deposit £2 2s.).

**Norwich.**—St. Albans' Church, Lakenham; Rev. L. T. Burleigh, vicar.

**Nottingham.**—Houses (279) and flats (32), on the Wollaton Road Estate; H. M. Nowell, Ltd., builders, Heathfield Road, Hucknall Road.

**Oldham.**—Church and presbytery for the Rev. J. Lineham, of St. Anne's Church, Greenacres; H. Greenhalgh, architect, 15, Mawdesley Street, Bolton.

**Otley** (YORKS).—Offices for the Otley and Wharfedale Building Society; H. Chippindale and T. H. Gamble, architects, Springfield, Guiseley.

**Penrith.**—Sewage disposal works at Motherly; W. S. Lythgoe, U.D.C. surveyor, Council Offices.

**Ponders End** (MIDDLESEX).—Boiler house and extensions, cabinet works, Lincoln Road; L. G. Ekins.

**Portsmouth.**—Methodist Church, Drayton, with electrical and heating work (£7,000); A. E. Tutte, architect, 42, Commercial Road; S. Salter, Ltd., builders, Southsea.

**Quarry Bank.**—Houses (68), Saltwells Wood site; E. W. Turner, U.D.C. architect.

**Rawtenstall.**—Houses, Lower Carr Farm Estate (£16,000); borough surveyor.

**Romford.**—Houses (42), Ingrebourne Road, Rainham (42) and Upminster (20); R.D.C. surveyor.

**Rotherham.**—Reconstruction of premises, College Street, for Marks & Spencer, Ltd.; Bovis, Ltd., builders, 35, High Street, Marylebone, W.1.

**Salford** (LANCS).—Reconstruction of Regent Road police station; city surveyor.

**Scarborough.**—Shops, Northstead (£3,368); F. Whittaker, Ltd., builder, Leeds.

**Sevenoaks.**—Laboratory for the Walthamstow Hall High School for Girls; governors.

**Sheffield.**—Three shops, Ecclesfield Road; Rhodes & Mitchell.

**Slough.**—Business premises, High Street, Marks & Spencer, Ltd., London. Factory, Argyll Avenue, Slough Estates, Ltd.

**South Shields.**—Houses (40), Marsden; W. Welsh, R.D.C. surveyor, Council Offices. Synagogue (£8,000); Carruthers & Salt, builders, 1, Heugh Terrace.

**Stockport.**—Shopping centre, Culver Road, for Mr. H. Whiteley; G. Clayton, architect, 4, Wellington Road.

**Stourbridge.**—Wesleyan Church, Gig Mill; J. M. Tate, builder, Colley Gate.

**Sunderland.**—Houses (100); E. Hitchens, R.D.C. surveyor, Council Offices.

**Taunton.**—Houses (50) for the T.C.; F. & E. Small, builders.

**Tow Law** (DURHAM).—Houses (100); U.D.C. surveyor, Council Offices.

**Tynemouth.**—Rehousing for slum tenants; borough engineer. Water offices and depôt, Ashington; water engineer. Reconstruction of Bedford Street electrically lighted with arcade; W. H. Bainbridge & Sons.

**Wallasey.**—Houses (60), Pasture Road (£16,716); Lloyd and Cross, Ltd. Houses (246), Wallasey Village; Tate, Pumford and Doughty.

**Wallsend.**—Houses (82), Eldon Street and Smeaton Street; borough engineer.

**Warrington.**—Houses (50), Thelwall Lane; borough engineer.

**Weetslade** (NORTHUMBERLAND).—Houses (20), Annitsford; U.D.C. surveyor, Council Offices. Houses (40), Leaton Burn and Hazelrigg; Braithwaite & Co., Heaton, Newcastle-on-Tyne.

**Wembley.**—Development of Smith's Estate; P. H. Edwards, Ltd.

**West Bromwich.**—Joseph Edward Cox Council School, Friar Park; A. Lewis, director of education, Education Offices, Highfield.

**Weston-super-Mare.**—Houses (28); Sealy and Gibbs and J. Standerwick & Sons, builders. Ice rink café and tea gardens, Knightstone Road; Mr. Denning.

**West Sussex.**—Casual wards, Chichester and Horsham; and extensions to boys' and girls' secondary schools, Chichester; Mr. Stillman, county architect.

**Weybridge.**—Cinema and shops, corner of Oakfield Estate; U.D.C. surveyor. Shops, flats and hall, Temple Market Corner; E. H. Thompson, architect, High Pine Close.

**Whickham** (DURHAM).—Houses (80); R. Baxter, builder, Hodgsons Lane, Blyth.

**Wickford** (ESSEX).—Mental hospital, the Runwell Estate; Elcock & Sutcliffe, architects, 60, Strand, W.C.

**Wigan.**—Alterations to head office, King Street, for the Savings Bank; D. A. Ablett & Sons, builders, Sovereign Road Saw Mills. Houses (54); borough surveyor.

**Wolverhampton.**—Business stores and showrooms, Darlington Street, for Phillips & Jones, Queen's Square.

**Worcestershire.**—Senior School, Evesham, for the E.C.

**Workington.**—Houses (22), Salterbeck Estate, borough engineer.